

INDIAN COUNCIL OF MEDICAL RESEARCH

Special Report Series No. 41



**Nutrition
for
Mother and Child**

**P. S. Venkatachalam
and
L. M. Rebello**

**NATIONAL INSTITUTE OF NUTRITION
(Indian Council of Medical Research)
HYDERABAD-7**

1971

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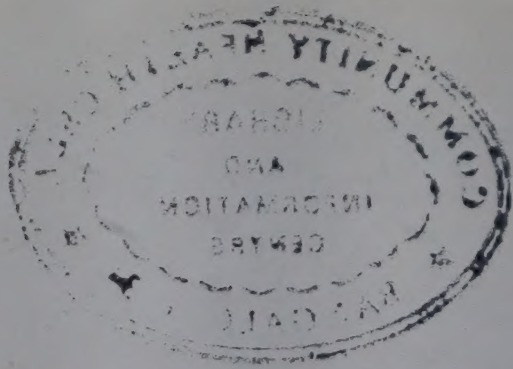
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PREFACE TO THE FIRST EDITION

It is well-known that the maintenance of health is greatly dependent on adequate nutrition. Ensuring adequate nutrition to our expectant and nursing mothers and to our infants and children should receive the highest priority in any public health programme. Extensive diet and nutrition surveys, carried out in different parts of the country, have indicated the wide prevalence of malnutrition in mothers and children, specially of the poor socio-economic group. The improvement of nutrition of our people call for a coordinated action in many fields. The combating of faulty dietary habits, arising from ignorance and superstition, is obviously an essential part of such a programme.

We have an impressive network of Health Centres and Maternal and Child Health Centres in our country. These are the obvious media through which nutrition education of these vulnerable groups should be attempted. As early as 1957, the Nutrition Advisory Committee of the Indian Council of Medical Research recognised the need for the preparation of suitable nutrition education materials for use in the training of the auxiliary health personnel working in these Centres. The present booklet is an effort in this direction and is written in clear and simple language.

The booklet sets out the nutritional needs of the mother during pregnancy and lactation, and of the infant and the pre-school child. It contains information regarding the diet for each of these groups and also practical ways of improving the present inadequate diets of the expectant and nursing women, infants and children, at different economic levels. The low-cost nutritious preparations for children, described in the booklet, have been demonstrated to a group of rural mothers and later tested on their children, for acceptability and tolerance.

It is hoped that this booklet will serve a wider purpose than the training of the workers of the Health Centres, and will prove useful to the average Indian housewife in ensuring better health for herself and her child.

C. GOPALAN

Director

Nutrition Research Laboratories,
Hyderabad.

PREFACE TO THE SECOND EDITION

The first edition of '*Nutrition for Mother and Child*' brought out in 1962 has been quite popular and it became necessary to get a reprint in 1966. There has been a persistent demand for the book and it has been found necessary to bring out a second edition.

In recent years, there has been noteworthy advances with regard to nutrient requirements, especially of children and pregnant women and nursing mothers. The Nutrition Expert Group of the Indian Council of Medical Research revised its recommendations of dietary allowances for Indians in 1968. These recommendations have been taken note of in preparing this revised version.

It is hoped that the book will continue to be useful as before for the Indian housewife and for those concerned with health care of mothers and children.

National Institute of Nutrition,
Hyderabad.
7th July, 1971.

C. Gopalan
Director

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CHAPTER I

INTRODUCTION

Food is the chief source of essential materials which the body needs for its well-being. These essential materials are collectively called “nutrients”. Good food is indispensable for health at all stages of life and for satisfactory growth during infancy, childhood and adolescence. Wholesome food in adequate quantities is no less important for pregnant and nursing women since they undergo a severe nutritional stress.

Functions of Food

Food provides **Energy** to keep the body warm, the muscles active for work and play, and the various organs alert to carry out the daily activities.

Food also supplies **Building Materials** needed for growth. While the foetus (unborn child) develops in the mother's womb, new tissues are being continuously built. This proceeds right through infancy, childhood and adolescence. Hence, during these periods of life there is a tremendous demand for Building Materials. Apart from this, Building Materials are needed at all stages of life since new tissues must be built every day to repair the daily “wear and tear”.

Food performs another important function in the body. This function for purposes of convenience is described as the **Protective Function**. Food is able to perform it by virtue of certain nutrients present in natural foodstuffs and required in minute quantities. There are a variety of these nutrients, each responsible for a specific task in the body. If the diet is deficient or lacking in one or more of these vital substances, it leads to a derangement of the normal functioning of the different parts of the body, resulting in ill-health, stunted growth and imperfect development.

Based on the above considerations, foodstuffs may be broadly classified under three heads, viz., **Energy-yielding**, **Body-building** and **Protective** foodstuffs, according to the predominant role they play in sustaining life.

Energy-Yielding foodstuffs form the great bulk of the ordinary diet. They supply energy to keep the body warm and are hence known as “fuel-foods”. A few examples of energy-yielding foodstuffs are cereals, starchy vegetables, pulses, nuts, sugars and oils.

Body-building foodstuffs contain a satisfactory amount of the nutrients needed to build the body and replace the worn-out tissues. Milk and its products, meat, fish and eggs are the best representatives of this group of foodstuffs. The other examples are grams, dals, dried beans, peas and nuts. Cereals also contain some body-building materials.

Protective foodstuffs are those which contain the protective substances, of which a large number is needed by the body. Almost all natural foodstuffs contain one or more

of these protective nutrients. There is, however, no single foodstuff in which all the different protective substances are present in quantities sufficient to meet the daily needs of the body. *This is why a combination of different kinds of foodstuffs is essential in a diet.* Best examples of this group of foodstuffs are green leafy vegetables, fresh fruit, milk, meat, fish and eggs. These foodstuffs contain sufficient amounts of one or more of the protective nutrients so that a combination of them yields enough to maintain life.

Balanced Diet.—In order to obtain adequate amounts of each of the different nutrients, our daily diet should include appropriate quantities of a variety of different foodstuffs. Variety is of the greatest importance. An unvaried diet is not only distasteful but may have serious consequences on health and recovery from disease. A diet in which various foodstuffs are mixed in suitable proportions to carry out adequately the three functions described above, is known as a **balanced diet**.

The five food groups.—On the basis of the predominant nutrient contained in foodstuffs, the latter are classified into the following **Food Groups** (Table I).

TABLE I
Food Groups

The Five* Food-Groups	Food-stuff
I	MILK Milk, curds, butter milk, panir (cheese), milk-powder. PULSES Dals, grams, dried peas and beans, groundnut and other nuts. MEAT etc. Mutton, beef, poultry, game, fish, egg.
II	FRUITS Papaya, orange, tomato, melons, lime, mango, custard apple, amla, guava, sapota, grape, ripe banana, apple etc. GREEN LEAFY VEGETABLES Sag or keera, tops of radish, onion, carrot etc., drumstick leaves, mint, lettuce, cabbage etc.
III	OTHER VEGETABLES Beans, brinjal, cucumber, carrot, drumstick, kova, radish, onion, chillies, ladies-finger, pumpkin, bittergourd etc.
IV	CEREALS Rice, wheat, maize, jowar, bajra, ragi and other millets. STARCHY VEGETABLES Yams, colocasia, tapioca, potato, sweet potato, tender jack-fruit, cooking plantain.
V	FATS AND OILS Vegetable oils, butter, ghee and other fats. SUGAR Jaggery, cane-sugar etc.

*Condiments and spices contain some nutrients but are mostly used to give flavour and promote appetite.

This grouping of foods may not be the ideal but it is practical and easy to follow. It serves as a general guide to choose a Balanced Diet. It also provides information as to which of the different foodstuffs can be substituted for one that may be temporarily unavailable.

Staple food.—All people consume one or the other of the foodstuffs listed in Group IV. The one used most commonly is called the Staple Food. This staple varies from region to region. It is generally observed that individuals and families may concentrate too much on eating large amounts of the staple food to the exclusion of foods from the other Groups. In order to meet their nutrient needs, every one should eat daily, at least one food item in sufficient quantity from each of the **Five Food Groups**.

Food requirements.—These will vary according to the age, sex and activity of the individual. Special demands are made during stress periods, such as pregnancy, lactation, infancy and childhood, since during these periods the individual needs increased amounts of Body-Building and Protective nutrients. If the mother, both during pregnancy and lactation, and the baby are not able to obtain adequate nourishment, their health is likely to be impaired. This is why children and expectant and nursing mothers are referred to as the **Vulnerable Groups**.

An attempt is made in the following pages to indicate the special food needs of each of these groups and to furnish practical suggestions as a guide towards helping them select a suitable diet.

CHAPTER II

NUTRITION FOR THE EXPECTANT MOTHER

Child-bearing imposes a great strain and it is important that the would-be-mother leads a healthy life throughout pregnancy. One of the major factors that promotes health and well-being, both of the mother and the baby in the womb, is wholesome, nourishing food. Frequent visits to a family doctor or a health centre will enable the pregnant woman to learn what she should eat to safeguard her health, undergo an uneventful pregnancy and deliver a strong and healthy baby. The magnitude of the nutritional stress during pregnancy and the reasons why an expectant mother should have adequate nourishing food are briefly described in the following paragraphs.

Growth of foetus.—The woman creates a new life the moment when the single-celled egg (ovum) gets fertilized. In the first 8 to 12 weeks of pregnancy, the fertilized egg, which is described as an Embryo, grows, and the process of making a new individual commences.

In the early stages and up till the 12th week, the embryo, which is about 2 inches long, relies wholly on the surrounding tissues for its nourishment. Later on, the embryo is known as the Foetus and it grows at a tremendous pace, increasing in weight from a mere half ounce around the twelfth week to a full-grown baby of about 7 lbs. around the 40th week. In order to provide for this rapid growth, which includes formation of bone, production of blood and building of muscles, brain and other tissues, the foetus needs ready-made nutrients. These are solely derived from the mother's body through her blood stream. It is, therefore, necessary that throughout pregnancy and particularly after the 12th week till delivery, the mother pays special attention to the kind and quantity of food she eats, since this will determine the health of her baby.

Changes in mother.—In addition to meeting the needs of the growing baby in the womb, nourishment is required by the mother for certain other purposes as well. Side by side with the development of the baby, important changes take place in a pregnant mother's body. In a way, the mother also grows. There is an increase in the overall size of her body. There is an enlargement of the child-bearing organs to accommodate the developing foetus, an increase in the breast tissue to meet the subsequent demands of lactation, and an increase in the amount of circulating blood to facilitate the supply of nourishment to the newly built tissues.

Since there is not much gain in body-weight during the early weeks of pregnancy, it is often believed that this early period does not impose any nutritional strain on the mother. While this is partly true, nausea and vomiting, so common at this time, not only limit the intake of food, but may also result in the loss of important nutrients. Hence, the pregnant woman must take care that she consumes food of good quality even during the early days of pregnancy, to offset the effects of disturbed appetite seen in a large majority of pregnant women.

DOES A WELL-NOURISHED MOTHER PRODUCE A BETTER BABY?

DATA FROM STUDIES CARRIED OUT IN
COONOR, HYDERABAD & MADRAS

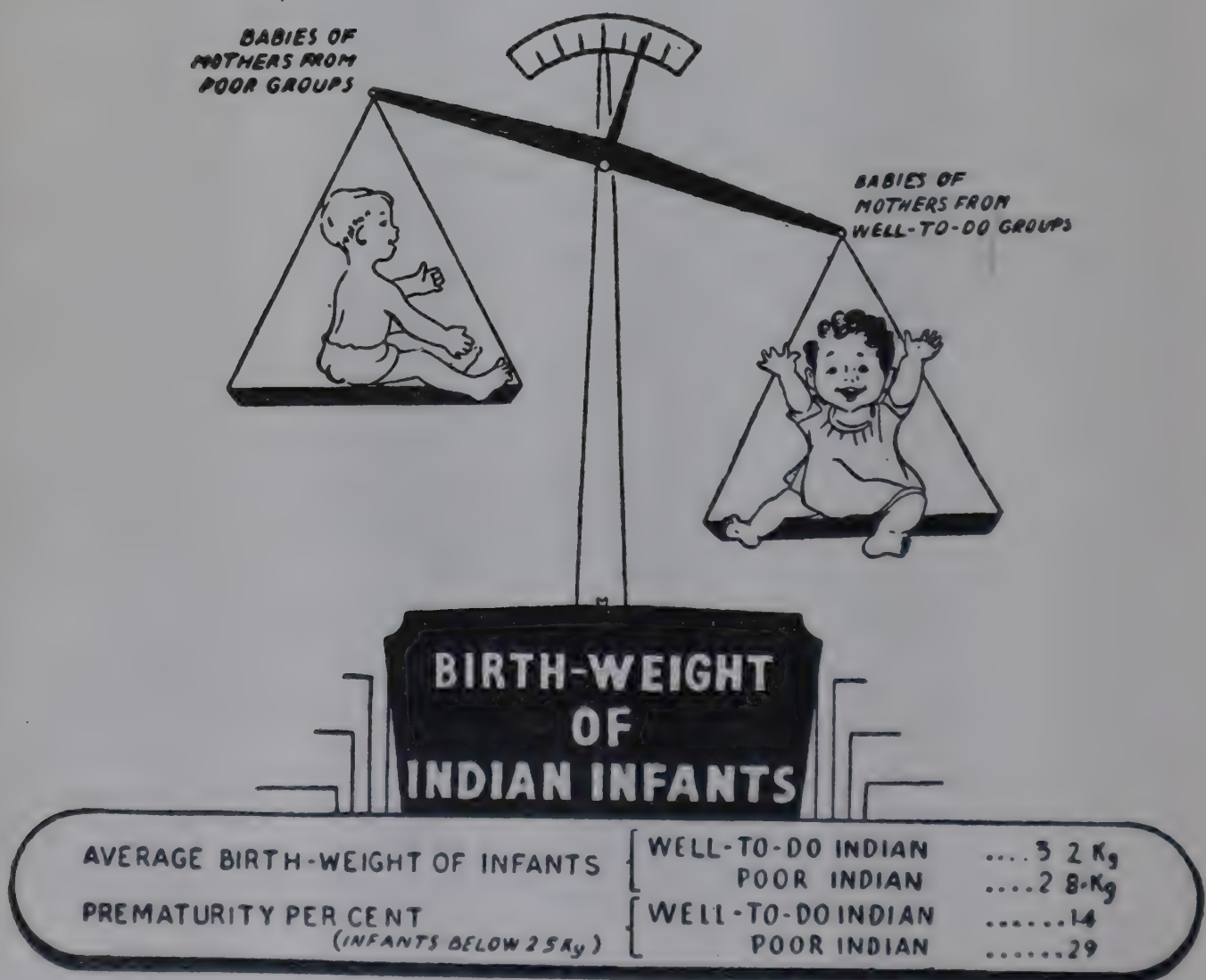


Fig. 1.

Birth-weight of the baby.—The mother's diet has a direct influence on the weight of the baby at birth. The average birth-weight of infants born to women eating inadequate and nutritionally poor diets is significantly lower than the average birth-weight of babies produced by those consuming a nourishing diet (Fig. I). This low birth-weight is a sign of immaturity, and connotes that the baby's organs and tissues are not developed fully. The high incidence of immaturity, in turn, leads to a high infant death rate during the first few days of life. On the other hand, the number of such deaths is small among infants whose mothers consume an adequate diet during pregnancy.

Early infancy.—Further an inadequate diet during pregnancy can have other far reaching effects on the health of the baby during early infancy. A large proportion of infants who manage to survive the first few weeks, either develop various nutritional diseases such as anaemia, rickets etc., or suffer from recurrent infectious diseases because they lack the power of resistance.

Effects on maternal health.—Besides having an ill-effect on the newborn as well as the infant, an inadequate diet during pregnancy imperils the mother's own health. When her diet does not supply the nutrients essential for her needs and those of her unborn child, she supplies nutrients to the baby in the womb by withdrawing them from the tissues of her own body. This tissue depletion weakens her so much that she is unable to cope with the strain of child-bearing. A poor "maternal diet" increases not only the risk of serious complications during gestation but often results in a difficult and sometimes prolonged labour. On the other hand, women, who eat a suitable diet all through pregnancy, deliver larger and heavier babies with a comparatively easy labour.

In India, the death rate of women during the child-bearing years is very high. This is chiefly due to the inability of ill-nourished mother to stand the strain of frequent child-bearing, which all too often leaves her weak to resist infection in general and tuberculosis in particular.

Equally revealing is an analysis of the cause of infant deaths in this country. A large number of infant deaths is directly attributable to debility of the mother and "premature" birth.

The above observations help to illustrate why sufficient amounts of the proper foods are a necessity for every expectant mother if she wishes to deliver a healthy baby and remain healthy herself to look after it.

CHAPTER III

DIET IN PREGNANCY

The importance of an adequate and nutritious diet during pregnancy was stressed and the harmful effects of consumption of a defective diet on the woman and her baby were recorded. Let us consider now the pattern of diet commonly consumed by the pregnant woman belonging to the low-income group in South India, observe its defects and see how best we can improve the diet without creating any strain on her resources.

Prevalent diet during pregnancy in South India.—Though information about the food intake of pregnant Indian women is scanty, the results of observations thus far show that the diet is not satisfactory. In some instances, the food intake was found to be insufficient even on the basis of the requirements for the non-pregnant women.

The following is the general pattern observed in South India.

TABLE II
Diet of South Indian Pregnant Women
(Average figures—Results of Diet Surveys)

Food Group	Food-stuff	Amount per day (Grammes)
I	Milk and curds	40
	Pulses, dried beans and nuts	20
	Meat or fish)	
	Egg	20
II	Fruits	25
	Green leafy vegetables	8
III	Other vegetables	20
IV	Rice	
	Wheat and millets)	275
V	Fats and oils	20
	Jaggery	12

*The defects of the above diet are as follows:—*It consists mainly of rice, supplemented with a little pulse and vegetable. Often, a ground mixture of dry red-chillies and salt is kept as a standby and when no vegetable or pulse preparation is made, which is not infrequent, the chilli-salt mixture is liberally used. The choice of foodstuffs is also extremely limited, with foods from Group IV being eaten to the almost entire exclusion of foods from the other Food Groups. Milk is only used in tea or

coffee, and flesh-foods, eggs and fruit are often only festival foods. Usually two main meals are eaten and necessarily they have to be uncomfortably bulky in order to satisfy the nutritional needs of a healthy woman. The discomfort is particularly harmful during early and late pregnancy for obvious reasons.

Effects of such a deficient diet.—The inadequate consumption of foods from Groups I and II, especially milk and leafy vegetables, will lead to a dearth of certain valuable nutrients vitally necessary to build sound, straight bones and ample red blood in the unborn baby. An inadequate supply of these nutrients results in a baby with bent or poorly formed bone-structure and pale, insufficient blood. Further, additional amounts of these nutrients are needed to be stored as reserves in the baby's liver, spleen and bones to provide for the early months after birth, as breast-milk does not contain a sufficient amount of these nutrients. If the mother is weak and consumes an inadequate diet, she will be unable to supply these additional amounts of nutrients to her baby, resulting in low reserves and consequent development of nutritional disorders. Moreover, constant withdrawal of these nutrients from the maternal body, to meet the demands of pregnancy, can cause anaemia and soft or bent bones (osteomalacia) in the mother.

The deficiencies in the diet of South Indian pregnant women of the poorer classes will be more apparent if it is compared with the Balanced Diet for a normal woman during pregnancy, as given in Table III.

TABLE III
Balanced diet for a pregnant woman

Food Group	Food-stuff	Amount per day (Grammes)
I	Milk, curds etc.	225
	Pulses, dried beans, nuts	45
	Meat, fish, egg	60
II	Fruits	30
	Green leafy vegetables	150
III	Other vegetables	125
IV	Rice, wheat and millets	350
V	Oil, ghee, butter etc.	35
	Sugar and jaggery	40

Estimated cost (approximately) (excluding cost of condiments and fuel) = Rs. 1.49

Balanced diet during pregnancy.—The diet during pregnancy should contain larger amounts of “tissue building” and “protective foods” without any great increase in the “energy-yielding” foods. The need for energy in a pregnant woman is not raised much above her pre-pregnancy requirements. On the other hand, the woman's need

for "body-building" and "protective foods", particularly during the latter part of pregnancy, is increased to nearly double that of her usual requirements. After a careful examination of the needs of an expectant mother, nutrition experts have suggested a "balanced diet" for pregnancy. Such a diet contains adequate amounts of all the essential nutrients needed to maintain the health of the pregnant woman and the child in her womb. The balanced diet is a "mixed diet" composed of a selection of foodstuffs from all the Five Food Groups, with liberal amounts of foodstuffs from Groups I and II, the foods important during pregnancy.

The diet as given is suited for those who are used to consuming flesh-foods and eggs. If there is any objection to the consumption of these foods, the following changes may be made :

The change involves increased intake of pulses and milk in Food Group I, and exclusion of meat, fish and eggs.

FOOD GROUP I :

Increase milk and milk products and pulses :

Increase the quantity of milk to 325 ml.

Increase the intake of pulses to 60 gm.

The cost of this diet is approximately Rs. 1.32
(excluding cost of condiments and fuel).

CHAPTER IV

NUTRITIOUS LOW-COST DIETS FOR PREGNANT WOMEN

The Balanced diet is an ideal which may be kept in mind when trying to effect any change or improvement in the existing dietary pattern. Attempts in this direction are, however, beset with difficulties on account of high cost of food and low economic status of the people, but there is no cause for discouragement. A judicious combination of foodstuffs can yield a nutritionally satisfactory diet without appreciably increasing the cost.

In this Section, a few examples of cheap nutritious diets are provided to meet the needs of the pregnant woman.

Low-cost diets.—The diets in Table IV are examples of such low-cost improved diets. In the same Table is indicated the recommended balanced diet and the diet being consumed by the pregnant women of South India. In evolving the diets, the limitations of cost have been kept in view, and they have been specially compiled to provide maximum nutrition for the unit of money spent. The examples are also intended to serve as models for construction of similar improved diets to suit individual taste and needs.

A commentary on the low-cost diets.—The salient features of the four examples of low-cost diets described in Table IV for use among pregnant subjects are, *the inclusion of a variety of foods from all the Five Food Groups, sufficient green vegetables and at least a small amount of milk daily.*

Diet A.—This diet costs less than the balanced diet and includes a mixture of cereals etc. (Group IV). However, the total amount of cereals is more than that recommended in the balanced diet to offset other changes. It contains a moderate amount of fresh milk necessary for pregnant women and provides satisfactory amounts of vegetables of different types to supply the protective substances. The diet is suitable for those who have no prejudice against drinking milk.

Diet B.—From the nutritional point of view, Diet II is almost the same as I. Fresh milk is here replaced by skim milk powder of equal nutritive value. The oil in the diet is increased since skim-milk is devoid of fat. The diet is recommended for those who have no objection to the use of skim milk powder and in cases where fresh milk is not easily available.

Diet C.—This diet features the following points : the cost is the lowest among the four diets listed, only a minimum amount of milk is included. The amount of pulses and leafy vegetables is kept at the recommended level in order to offset to a certain extent the effects of reduction in the quantity of milk. The cost is reduced further by decreasing the amount of fat.

It may be stated that from the point of view of nutrition, Diet C stands lowest among the four examples offered. In spite of this, the diet is a considerable improve-

TABLE IV
Low-cost diets for pregnant woman

Food Group	I				II		III	IV		V		Approximate cost Rs.
	Pulses etc.		Meat	Egg	Fruit	Green leafy vegetable	Other vegetable	Rice	Millets etc.	Oils	Sugar and Jaggery	
	Milk etc.	gm.										
Diet	ml.	gm.	gm.	gm.	gm.	gm.	gm.	gm.	gm.	gm.	gm.	
Balanced diet for a pregnant woman (Non-Vegetarian)	225	45	30	30	30	150	150	<— 350 —>		35	40	1.49
Prevalant diet of S. Indian pregnant woman	40	20	<— 20 —>		25	8	20	<— 275 —>		20	12	0.64
Nutritious low-cost diets :												
A	225	40	Neg.	Neg.	30	110	55	250	140	20	30	1.02
B	22 gm. 40 (Skim milk powder)		Neg.	Neg.	30	110	55	250	140	28	30	1.00
C	110	45	Neg.	Neg.	55	150	110	250	140	7	15	0.90
D	110	40	55	One egg	55	110	110	250	140	15	30	1.47

Neg. = Negligible

ment over the prevalent diet of pregnant women. The nutritive value of this diet can be increased by increasing the quantity of milk to the limit of economic possibility.

Diet D.—It is specially compiled for those who take flesh-foods. The major change in this diet is that the amount of milk is cut down to the barest minimum and in its place, flesh-foods and egg are included.

Summary of Nutritional Principles Underlying the Choice of Foodstuffs

Group I: Pulses.—As in the case of cereals, the consumption of a mixture of dals, grams, dried beans, peas and nuts is desirable. Such a mixture along with milk assumes great importance in the diet of those who do not consume flesh-foods and egg.

It is essential that our pregnant women learn to use adequate quantities of pulses. There is a widespread belief that consumption of large quantities of dal might produce indigestion and “stomach upsets”. This is not true. Even small children have been found not only to tolerate but thrive well with a large quantity of pulse in the diet. A variety of grams and beans may be sprouted before consumption. In fact, sprouting grams before use is popular in certain parts of India. The process of sprouting not only improves the flavour but renders it easily digestible and adds to the nutritive value.

Meat etc.—Weight for weight, fish and meat are of equal nutritive value and are therefore interchangeable in the diet. Cheap meats such as beef and small low-priced fish, while improving the quality of the diet considerably, reduce the cost to a great extent. Organ meats, such as liver, heart, brain, kidney, tripe, and sweet-bread are very nutritious and at the same time comparatively low in cost.

Duck’s eggs are cheaper and could be used instead of hen’s eggs. Duck’s eggs should be thoroughly cooked. An egg may be said to be nutritionally equal to about 100 ml. milk. Thus an egg may be eaten on alternate days and a proportionate amount of milk reduced in the diet.

Milk and milk products.—A minimum of about 110 ml. milk is necessary during pregnancy. The larger the amount of milk a pregnant woman is able to take, the better for her.

Skim-milk powder is relatively cheap, and during processing loses none of its body-building and protective nutrients. Therefore, by substituting skim-milk powder for fresh-milk, equally nourishing milk can be had (Appendix I). Groundnut milk is another cheap and efficient substitute for fresh milk (Appendix II).

Group II: Green leafy vegetables.—Leafy vegetables in the amount indicated should be eaten at least three to four times a week, if not daily. On the other days, the proportion of pulses, milk and other vegetables is increased. When a leafy vegetable is not eaten, as far as possible a raw vegetable-salad, a green vegetable or a fruit should be eaten on that day. An extra serving of pulses and leafy vegetable may be eaten when it is not possible to have the recommended amount of milk and fruit. In

this connection, mention may be made of the place of kitchen gardens in ensuring a constant supply of fresh, leafy and green vegetables.

Fruit.—Fruits such as oranges, lemons, grapes, mangoes, tomatoes and amla may serve as partial substitute for green leafy vegetables and, if consumed, the amount of the latter may be reduced to about 55 gm. per day. Fruit contains large amounts of certain protective nutrients essential for the expectant mother. When there is a scarcity of fresh fruit or leafy vegetable, a variety of sprouted grams and beans could be used as alternative food. (The method of sprouting grams is described in Chapter X).

Group III : Other vegetables.—A serving of non-leafy vegetables helps to stretch the meat and pulse preparation and also add some protective nutrients to the diet. Vegetables washed and eaten raw are more nutritious than when they are cooked. They have valuable protective nutrients which may be lost as a result of faulty cooking. The correct method of storing and cooking vegetables is given in Appendix III.

Group IV : Cereals.—All cereals are essentially energy-yielding, though they do contain some quantity of body-building and protective substances. While bulk for bulk, the different cereals provide the same amount of energy, the amount of body-building and protective substances vary from cereal to cereal. Hence it is advisable that all subjects, and pregnant women in particular, consume a mixture of cereals and not be dependent on a single source of this commodity.

For rice-eaters, it is economical to substitute a part of the rice by millets such as ragi, jowar (cholam) etc. Ragi is especially rich in a nutrient which helps build sound bones and teeth. It is also advisable to use parboiled, hand-pounded or under-milled rice which is nutritionally superior to highly-milled raw rice.

Studies in nutrition have confirmed the traditional belief that the nutritive value of rice is enhanced as a result of parboiling. A rice grain consists of 3 parts : an outer layer, an inner part (endosperm) and the germ. The outer layer and the germ are richer in certain protective and body-building nutrients than the inner layers. When raw rice is milled, the nutrients present in the germ and outer layer are lost along with the bran and husk. During parboiling, the nutrients in the outer layer and the germ diffuse into the entire mass of the grain and are retained even after polishing. Parboiled milled rice is, therefore, more nutritious than raw rice polished to the same degree.

Starchy vegetables.—Certain root vegetables such as sweet potato, tapioca etc., serve as substitutes for part of the cereal (Group IV), but to be nutritionally adequate they have to be eaten along with fish, milk or pulses.

Group V : Sugar and jaggery.—Jaggery, being cheaper than refined cane-sugar, is economical. Apart from being cheap, it is possible that jaggery may provide some blood-forming nutrients which cane-sugar lacks.

Fats and oils.—Oil, ghee, butter etc., are the richest source of energy for the human body. Weight for weight they give more than double the amount of energy provided by other foodstuffs but they contain no body-building nutrients. Though there is no difference between one type of fat and another with regard to the energy value, animal fats such as butter, beef-fat, mutton-fat etc., unlike vegetable fats (liquid fat in oil),

contain a few protective nutrients dissolved in them. Even so, it does not necessarily mean that animal fats are superior to vegetable oils as long as the individual's diet contains other sources of protective nutrients.

In India, it is the practice to use vegetable oils such as groundnut, coconut, gingelly and mustard oil as a cooking medium for seasoning, frying, etc. The only animal fat in general use is butter, either as such or in the form of ghee. Fat of any type is, however, expensive and is included in minimal amounts in the average Indian diet. Yet research has shown that fat is in some way conducive to the maintenance of a healthy skin and hence it is desirable that the diet contains at least some quantity of fat.

In the sample diets described above, the amount of fat prescribed is kept at a low level of 7-20 gms. per day per individual in order to keep down the cost of the diet.

Some Do's and Dont's for the Expectant Mother

1. Too much of condiments and foods which habitually disagree with the system should be avoided.
2. Foods which have strong odours or those which leave a taste long after being eaten should usually be avoided as they may bring on an attack of nausea.
3. Plenty of water (at least four to six glasses) in addition to what is contained in the form of milk and other beverages should be taken daily, throughout pregnancy. This will help keep the bowels regular. It has been found that infection of the tube, connecting the kidney and bladder, is less common among pregnant women who drink a lot of water.
4. A minimum of salt shall be used in the diet.

General Arrangement of the Diet

As a majority of our pregnant women eat two main meals, it is difficult to distribute the quantities of foodstuffs recommended in any balanced diet between two meals without making the menu uncomfortably large. It is advisable, therefore, that a pregnant woman eats "a little" but "often". Apart from the two main meals, a pregnant woman ought to have a light, morning breakfast and a midmorning and afternoon snack. The smaller meals give added scope for the introduction of a variety of foodstuffs from all the Food Groups.

It is realised, however, that the practical implementation of this suggested meal pattern may be difficult in a large majority of pregnant women in our country. The women usually work right through pregnancy and frequently far away from home. Cooking for the family is done once a day during the evening. A larger portion of the meal left over is consumed next morning before proceeding to work. Another but smaller portion is taken along to the place of work to be used as lunch. In view of this, it becomes necessary to devise a suitable menu so that a balanced diet may be consumed in three meals instead of five.

The distribution of foods in the form of small meals and snacks as well as in the form of three large meals has been worked in the following pages. For those women who remain at home throughout the day, it will be ideal to follow the former schedule.

In each of the schedules (meal plan) the choice of foodstuff used is that listed under Low-cost Diet A (Table IV). This meal plan can easily be adapted to apply to other examples of low-cost diets.

The quantities stated in the balanced diet and the sample low-cost diets (Table IV) are in terms of raw foodstuffs. Since the cooking methods and the preparations vary from region to region, no attempt has been made to provide the equivalent in the form of cooked foods. However, as instructions in terms of servings are simpler and would be of great help to the pregnant woman in following the recommendations, the following three measures have been used in order to understand and appreciate the quantities that have to be consumed (Fig. II).

1. *A Tumbler*.—Height 3.5", diameter of bottom 1.75", diameter of top rim 3"; can hold 8 oz. (240 ml.) fluids. Used only to measure fluids.
2. *An aluminium bowl*.—1.5" height, 3.25" rim diameter; can hold 4 oz. (110 gm.), or 5 oz. (140 gm.) if overflowing. Used only for semi-liquid or liquid foods.
3. *A large spoon (oval shape)*: 3" long diameter, 1.75" short diameter, 0.5" depth; can hold 2.25 oz. (65 gm.) cooked rice when heaped full, and approximately 1.75 oz. (50 gm.) cooked leafy vegetable.

Schedule I.

(Three main meals and 2 snacks)

Morning meal : 7 to 8 A.M.

- | | |
|--|---------------------------|
| 1. Cereal-pulse preparation or Iddlies | ... 2 Nos. |
| 2. Sambhar (thin dal with vegetable) | ... 1 bowl |
| 3. Milk (Sugar or Jaggery to taste) | ... $\frac{1}{2}$ tumbler |

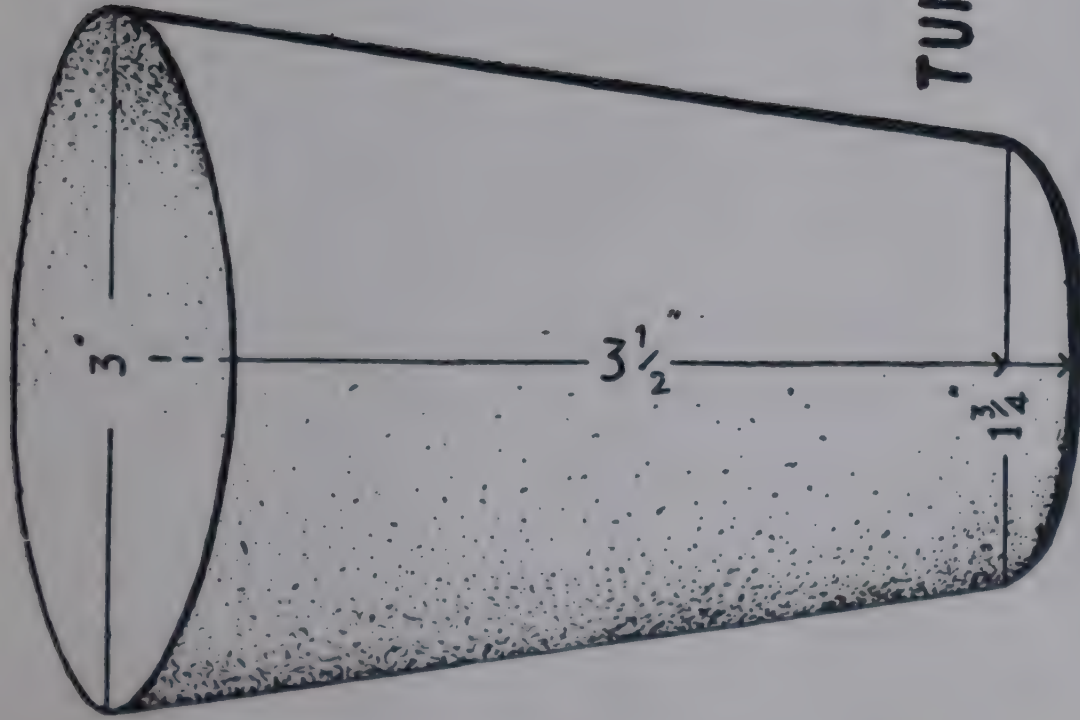
Mid-morning snack : 10.30 A.M.

1. Bananas : One small banana or any other seasonal fruit.

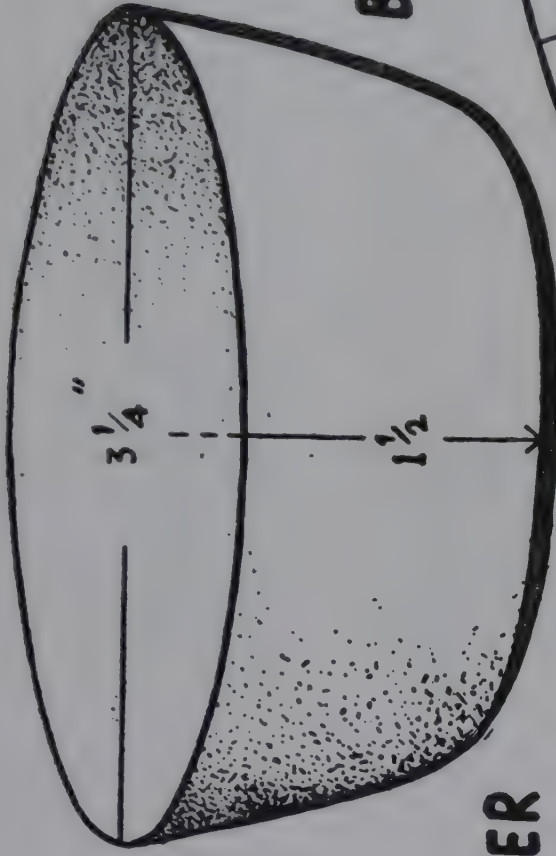
Noon-meal : 12 noon to 1 P.M.

- | | |
|---|---------------------------|
| 1. Rice (cooked) | ... 8 spoons |
| 2. Chappati (wheat or ragi) | ... 2 Nos. |
| or Roti (Jowar or bajra etc.) | ... 1 No. |
| 3. Sambhar | ... 2 bowls |
| 4. Green leafy vegetable or other vegetable | 1 to $1\frac{1}{2}$ bowls |

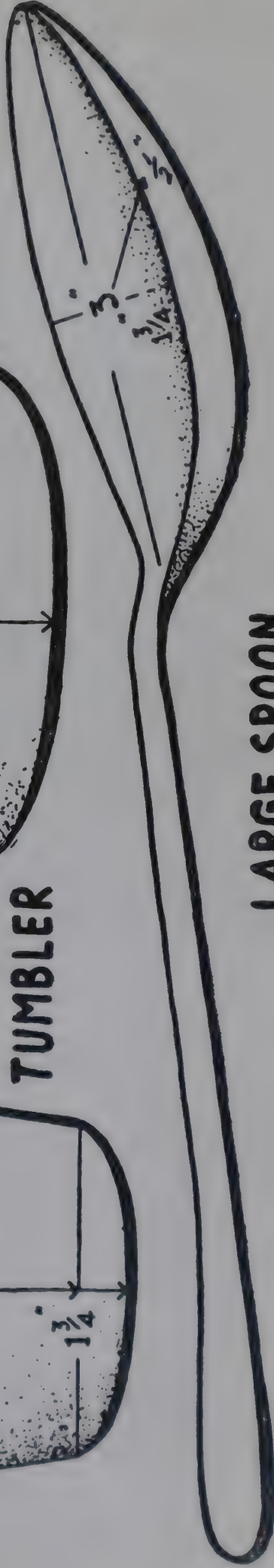
MEASURES USED IN SERVING



TUMBLER



BOWL



LARGE SPOON

Fig. II.

Afternoon snack : 4 to 5 P.M.

1. A handful roasted gram (Bengal gram), peas or groundnut.
2. Milk (Sugar or Jaggery to taste) ... $\frac{1}{2}$ tumbler

Night meal : 8 to 9 P.M.

1. Rice (cooked) ... 4 spoons
2. Chappati or Roti ... 3 or 2 respectively
3. Sambhar ... 1 bowl

In keeping with the common practice in South India, the "sambhar" or "charu" is prepared with vegetables and pulses. The entire amount is prepared once a day. Sambhar prepared with approximately 2 spoons or 55 gm. uncooked dal and 55-110 gm. leafy or other vegetable will yield about 6 bowls of the finished product. When leafy vegetable is added to the sambhar, the other vegetable can be made into a dry preparation and vice versa.

Schedule II

(3 large meals)

"Cooking done once a day"

*Schedule II-A.**Morning meal :*

1. Rice (cooked) ... 4 spoons
2. Chappati or Roti ... 2 or 1 respectively
3. Sambhar ... 1 bowl
4. Leafy vegetable (cooked) ... $\frac{3}{4}$ bowl
5. Milk (Sugar or Jaggery to taste) ... $\frac{1}{2}$ tumbler

Noon meal :

1. Rice (cooked) ... 6 spoons
2. Sambhar ... $1\frac{1}{2}$ bowls
3. A raw vegetable or fruit.
4. A small handful of roasted gram (Bengal gram), peas or groundnut in the course of work.

Night meal :

1. Rice (cooked) ... 4 spoons
2. Chappati or Roti ... 3 or 2 respectively
3. Sambhar ... $1\frac{1}{2}$ bowls
4. Leafy vegetable (cooked) ... $\frac{3}{4}$ bowl
5. Milk or Curds ... $\frac{1}{2}$ tumbler

*Schedule II-B**Morning meal :*

- | | |
|--------------------------------------|--|
| 1. Chappati (wheat) | ... 3 Nos. |
| 2. Dal | ... $\frac{1}{2}$ bowl |
| 3. Curds (Sugar or jaggery to taste) | ... $\frac{1}{2}$ tumbler (or
part as milk) |

Noon meal :

- | | |
|---|---------------------------|
| 1. Roti (maize, jowar or bajra) | ... 3 Nos. |
| 2. Leafy vegetable | ... 1 $\frac{1}{2}$ bowls |
| 3. A raw vegetable or fruit | |
| 4. A handful of roasted gram, peas or groundnut | |

Night meal :

- | | |
|---------------------|---------------------------|
| 1. Chappati (wheat) | ... 3 Nos. |
| 2. Rice (cooked) | ... 4 spoons |
| 3. Dal | ... $\frac{1}{2}$ bowl |
| 4. Vegetable | ... $\frac{1}{2}$ bowl |
| 5. Milk or curds. | ... $\frac{1}{2}$ tumbler |

The schedules do not include meat, eggs or fish. This does not mean that they are not necessary. Those who are accustomed to eating animal foods and are able to buy them, are welcome to incorporate these into the schedules.

CHAPTER V

NUTRITION FOR THE NURSING MOTHER

Breast-feeding is a greater strain on the mother than pregnancy, because the woman nourishes a "fully developed" and "rapidly growing" baby whose food needs increase day by day. If the mother's diet is satisfactory during pregnancy she will have accumulated a store of nutrients in readiness for satisfactory breast-feeding. If the mother is known to have gone through pregnancy successfully on a faulty and insufficient diet, it means she has freely drawn upon her own tissues to build her baby, and she will continue to do so as long as she nurses her child. In such cases it is imperative that the defects in the maternal diet are rectified forthwith, in order that she and her baby may be saved from malnutrition and its consequences.

Diet consumed by the average nursing-mother in India.—Both in kind and amount, the food eaten by nursing-mothers in poor Indian communities does not differ appreciably from that consumed by them during pregnancy. With the exception of rice which is consumed in slightly increased quantities, there is often no other change in the diet. A diet survey of nursing mothers in the low income-group has shown that only a small percentage of them was consuming milk. There is no doubt that the diet of nursing woman in India suffers from the same drawbacks as the diet consumed by them while they were pregnant.

In order that a mother may breast-feed her infant without any undue strain on her own body, she must continue to eat an adequate and balanced diet to meet the requirements of lactation. Unlike during pregnancy, the woman who is breast-feeding her baby requires not only larger quantities of "bodybuilding" and "protective foods", but also requires additional energy-yielding foods to facilitate the formation and copious secretion of breast-milk. Unfortunately, the prevalent diet is not only insufficient in body-building and protective foods belonging to Groups I and II, but also lacks a sufficient amount of energy-yielding foods represented in Group IV. Indeed, the diet is inadequate even for a woman who has no demands on her in the form of nursing.

Why extra diet of good quality is important during nursing.—In India it is the custom to breast-feed infants for prolonged periods ranging from six months up to even three years. This is sometimes done in the belief that nursing prevents another pregnancy, although the mother frequently becomes pregnant again. She nevertheless continues to "suckle" the first baby until the new one arrives, and occasionally even after the second baby has arrived. Our women are thus in an almost continuous state of lactation throughout the child-bearing period of their lives.

Studies carried out among them have revealed that when they were given extra amounts of body-building foods, they produced a larger amount of breast-milk for their infants. At the same time, their health also showed improvement. This is because

some of the body-building nutrients from the additional food were diverted to replenish the maternal tissues, which probably had been depleted by pregnancy and nursing.

It is fortunate that despite a faulty and insufficient maternal diet, the quality of the breast-milk does not suffer. On the other hand, it compares well with that of nursing mothers consuming excellent diets in other parts of the world. This is strange and can be explained only by assuming that the Indian nursing mother keeps up the quality by withdrawing nutrients from her own bone, blood and muscle for the formation of milk, since her inadequate diet is incapable of providing the nutrients required for satisfactory milk production. It may well be that there is a limit even for the continuous withdrawal of nutrients from the maternal body and this may result in deterioration of the quality and reduction in quantity of the milk. Hence, the drain on the maternal tissues must be checked by providing the raw materials for the production of breast-milk in the form of an excellent and nourishing diet.

A BALANCED DIET DURING LACTATION

A balanced diet suitable for a nursing mother shall contain the same kinds of food as those recommended during pregnancy (Fig. III), but in slightly increased quantities. The physical activity of the pregnant woman is curtailed as pregnancy advances, and the energy needs remain practically the same as those of a non-pregnant woman. On the other hand, soon after delivery, usually in a couple of weeks, women belonging to the poor sections of our population return to work and at the same time continue to nurse their infants. It is true that returning to work soon after delivery is a healthy practice, but it is essential to remember that the twin factors of physical activity and active production of breast-milk make additional demands for energy-yielding foods. A nursing woman shall, therefore, eat slightly larger amounts of cereal foods and starchy vegetables listed in Group IV.

The developing infant needs sufficient amounts of "body-building" and "protective" nutrients for rapid growth of the tissues. Mother's milk is the only means by which a solely breast-fed infant obtains these nutrients. Hence, the diet of a nursing mother shall also contain plenty of the elements which the baby is withdrawing through the milk. There shall be an increase in the intake of "body-building" and "protective" substances obtainable from foodstuffs listed in Food Groups I and II. If liberal supplies of these nutrients are available in the maternal diet, she would be spared the inevitable and relentless drain on her own tissues.

The additional requirements for nutrients are easily met by selecting a variety of commonly available foodstuffs without depending too much on rice or other cereals alone. The following diet (Table V) is an example based on the recommendations of the Nutrition Expert Group of the Indian Council of Medical Research, as suitable for a nursing mother.

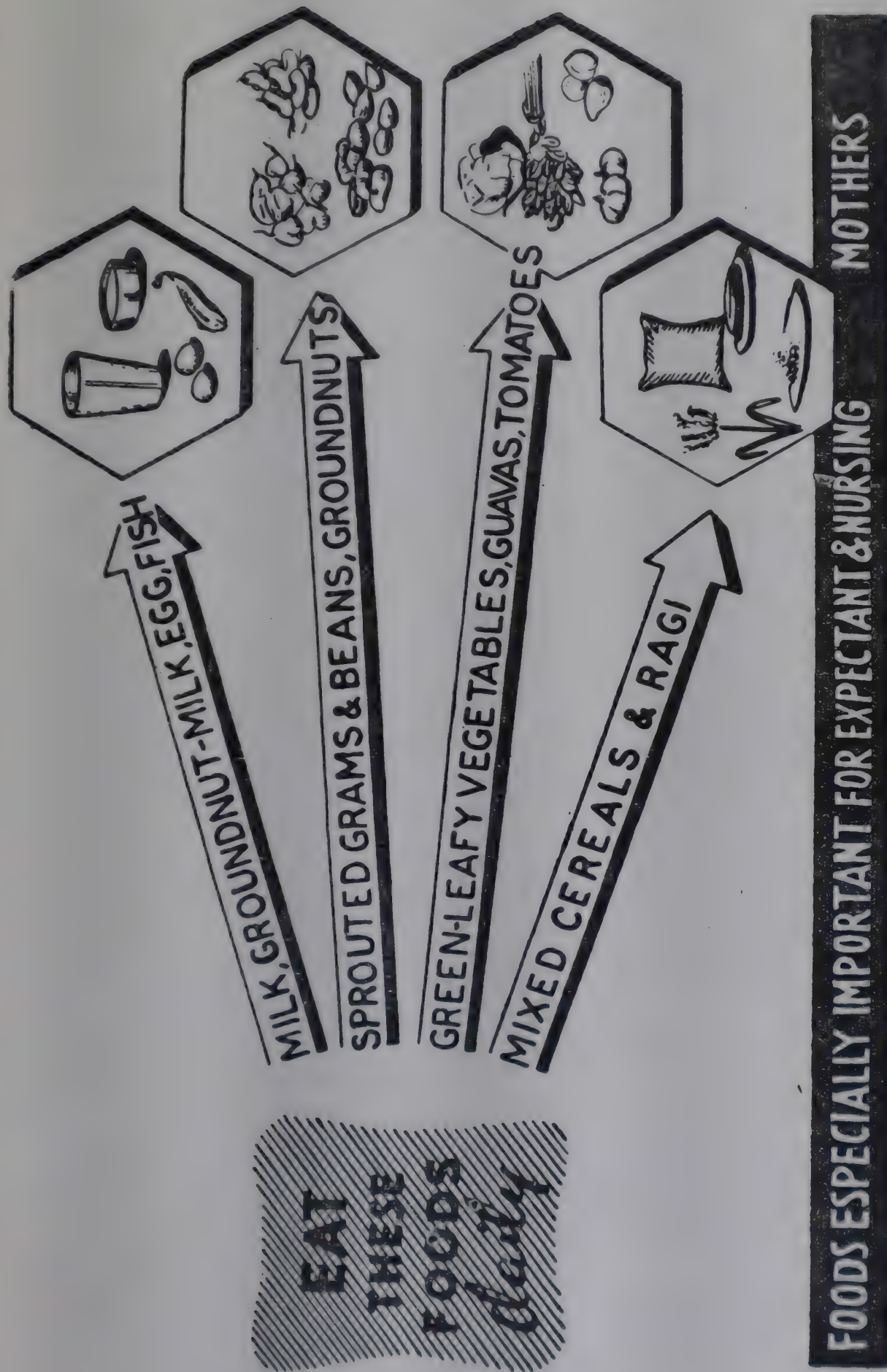


Fig. III.

TABLE V

Balanced diet for a nursing mother

Food Group	Food-stuff	Amount per day (Grammes)
I	Milk, curds ...	225
	Pulses, dried beans, nuts ...	55
	Meat, fish, egg ...	60
II	Fruits ...	30
	Green leafy vegetables ...	150
III	Other vegetables ...	125
IV	Rice, wheat and millets ...	400
V	Oil, ghee, butter ...	45
	Sugar and jaggery ...	50
Estimated cost (approximately)		= Rs. 1.64

The balanced diet for a nursing mother, which has been outlined above, includes flesh-foods and egg. If flesh-foods are not acceptable the following changes in the diet may be made :

Group I :

Increase milk and milk products and pulses.

The quantity of milk may be increased to 325 ml.

Increase the quantity of pulses to 70 gm.

The cost of this diet is approximately Re. 1.46 (excluding the cost of condiments and fuel).

As during pregnancy, plenty of water must be drunk during lactation, since water is needed for milk secretion.

Condiments are to be used sparingly, since, apart from being harmful if used in excess, they may give a flavour to the milk which may be repulsive to the baby.

LOW-COST DIETS FOR NURSING MOTHERS

No attempt is made here to give illustrations of low-cost diets for nursing mothers, since examples of such diets, given in the previous sections for use among pregnant women, are applicable to nursing mothers also, with slight alteration.

The following alterations are applicable in common to the four low-cost diets mentioned in Table IV.

Group I

Pulses, dried beans and nuts :

To be increased from 40 gm. to 50 gm. or more.

Group II

Green leafy vegetable

To be increased from 110 gm. to 150 gm.

Group III

Cereals :

To be increased from 390 gm. to 450 gm. mixed cereals.

These alterations will raise the cost of each low-cost diet by about 10 Paise per diet, per day.

CHAPTER VI

NUTRITION IN INFANCY AND EARLY CHILDHOOD

The human infant, unlike the young ones of other species, is wholly dependent for his food and care on others. With increasing age, it becomes more and more independent, and with nourishing food coupled with tender loving care in the early years, it can be expected to grow into a physically and psychologically healthy adult.

Why babies need more.—On the basis of unit body-weight, the infant as well as the young child has need for greater amounts of nourishing food than an adult. As in the case of adults, the active and healthy child needs food for energy and repair of wear and tear of tissues. In addition, extra nourishment is required to provide for the continuous increase in the size of every part of his body. Moreover, the child, as it grows, increases its range of activities. The little fellow romps about during almost every moment of his waking hours. This results in a vast increase in the energy needs, so that weight for weight the infant and toddler need more “energy-yielding” and “body-building” food than an adult. The actively growing tissues and the high energy output demand more of the “protective” nutrients to regulate the various functions of the body and keep the young one in perfect health.

Effects of improper feeding.—If the infant and the toddler are not provided with the nourishment they need, the development of malnutrition of one type or another is inevitable, depending on which of the nutrients are lacking in the diet. The early but unmistakable sign, giving the clue that all is not well with the nutrition of the baby, is a slowing of the rate of growth, sometimes leading to actual stunting. The baby is no longer bright-eyed, cheerful or active. He is fretful and disinclined to play or show interest in his surroundings. If he is not irritable and crying, he just lies limp in his bed. If he is not getting sufficient amounts of energy-providing foods either due to an insufficient amount of breast-milk in the early weeks, or due to delay in introducing the right type and amount of energy-yielding supplementary foods, he manages for a short time by drawing upon his own energy stores. As these are soon exhausted, he no more presents the appearance of the chubby round fellow he was. The fat of the cheeks disappears revealing the hollow contour of the bones, he literally wastes and finally becomes just skin and bone, a picture of misery before he passes away.

If the primary defect in the diet is a lack of adequate body-building foods of the right type, the child, instead of wasting away, remains “plump” and “fairly well covered”. This appearance may well give the mother and the child’s other well-wishers a false impression that the baby is thriving. It is not true. The plump appearance is due to the accumulation of water in the body which makes the child appear larger, and actually puts up his body weight so that the diseased condition is completely

masked. Inside the body, the unfortunate baby is breaking up his muscles to provide raw materials lacking in his food in order that he may sustain the essential functions of his body. He does not grow any more, becomes apathetic and irritable and develops a sickly pallor all over. If not recognised and treated promptly with rich sources of body-building foods, the condition invariably ends fatally (Fig. IVa).

Just as lack of "energy-rich" food in the diet brings about wasting and lack of "body-building" food, muscle-breakdown and accumulation of water, deficiency of the different "protective" substances bring about in their turn certain specific diseases. However, these illnesses, though not always fatal, lead frequently to considerable disability and affect the future well-being of the baby. For example, lack of protective substances in the diet may cause damage to the various parts of the eye and ultimately blindness, softening of the bone resulting in a crooked and stunted skeleton, soreness of the lips, mouth, gums and tongue, leading to much pain and discomfort and various other disturbances affecting the skin, blood, etc. (Fig. IVb).

It is necessary to emphasise at this stage that defective diet given to a baby, or for that matter any person, is usually defective all round and not deficient in any single nutrient. Hence, babies who are not provided a proper nourishing diet may show signs and symptoms of a mixed deficiency disease. This draws our attention to the importance of a Balanced Diet containing the right kinds of food in the right proportions (Table V).

Mothers and those who are responsible for the welfare of children ought to realise this, for it is they who are in the happy position of inculcating proper eating and living habits that act as the best safeguard against children's ill-health.

Weight-gain during infancy and childhood.—Whether the infant and the child get adequate nourishment or not is often assessed by following the gain in body-weight. In fact the practice of weighing babies at intervals to observe whether they are thriving is popular in western countries. Even in our own country, we see occasionally babies being weighed in child-welfare centres to determine the growth rate. It is a welcome practice and should be followed more regularly at all child welfare clinics.

However, it should be made clear that even though physical growth can be measured by weighing the baby at regular intervals, undue emphasis should not be placed on the weight changes from week to week. Few babies gain all the time, and in one week a baby may have a cold or be off his feed and barely show any gain at all, whereas the following week, when he is normal again, he may make an extra large gain to make up. As the baby grows, he will not only gain more slowly, but also irregularly. What really matters and requires to be looked into is the failure to put on weight over a continuous period.

An average well-nourished baby may be expected to show the following changes in body-weight from birth till about 5 years (Table VI).

Fig. IV (a)



A lack of sufficient body-building foods during infancy and early childhood results in a disease called "Kwashiorkor".

(i) A child suffering from the disease.

Fig. IV (a)



- (ii) The same child (as photographed on the previous page) after a month's treatment with a diet containing plenty of body-building foods.

Fig. IV (a)



(iii) A child suffering from "Marasmus" or wasting due to inadequacy of food.

Fig. IV (b)



Some of the diseases resulting from lack of 'Protective' nutrients in the diet:

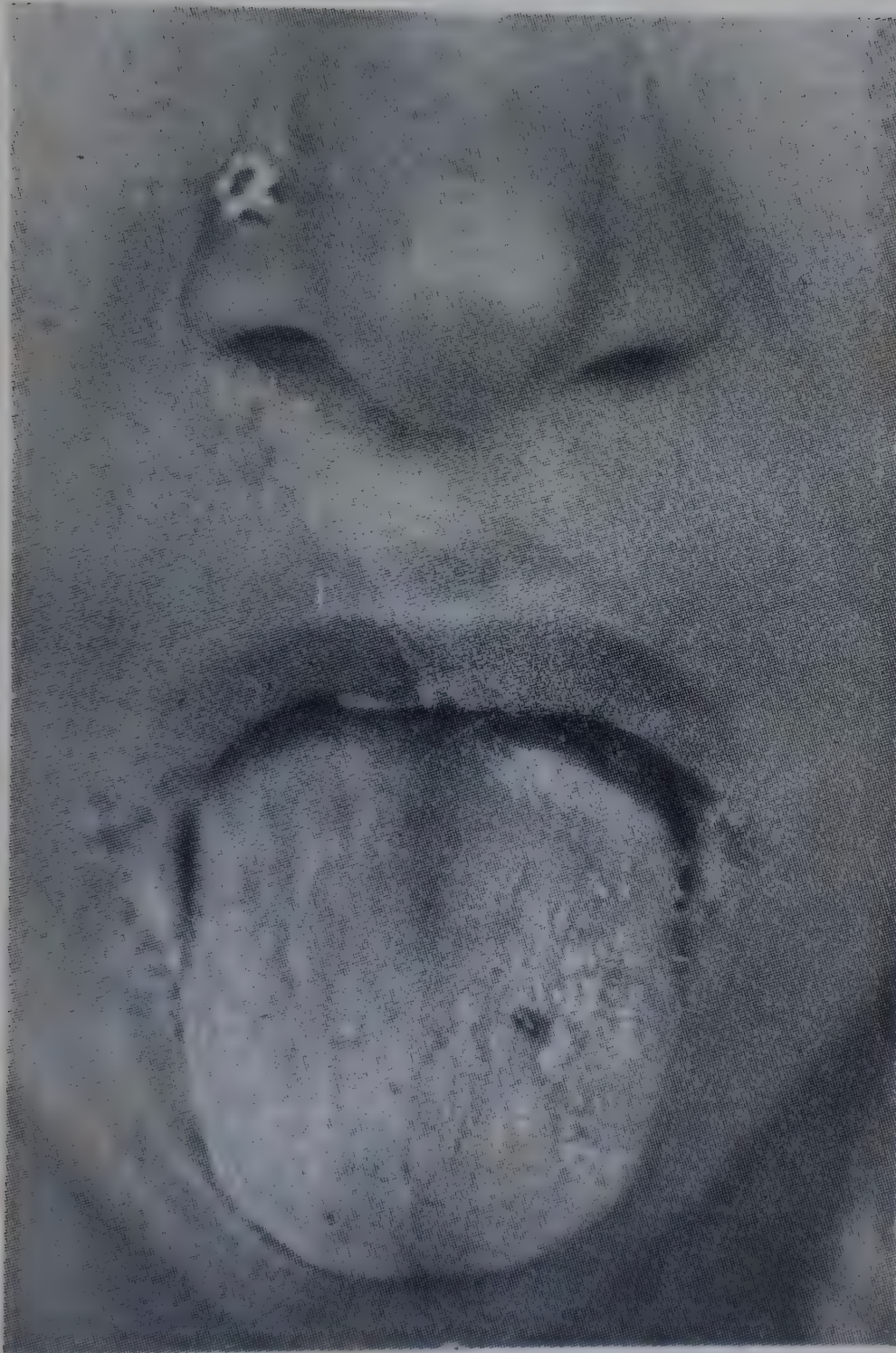
- (i) Severe damage to the eye resulting in blindness.**

Fig. IV (b)



(ii) Softening of the bones resulting in permanent disability, as a result of lack of 'Protective' nutrients in the diet.

Fig. IV(b)



(iii) Soreness and ulceration of mouth and lips, as a result of lack of 'Protective' nutrients in the diet.

Fig IV (b)



(iv) Soreness and ulceration of mouth and lips, as a result of lack of 'Protective' nutrients in the diet

The average weights incorporated in Table VI below are based on data collected in countrywide surveys by the Indian Council of Medical Research. A sound, well-fed Indian child can be expected to show the weight stated for a particular age-group.

TABLE VI
Changes in body-weight from birth till 5 years

Age			Average weight (kg.)
At birth	...	...	3
2 months	...	...	5
4 months	...	...	6
6 months	...	...	7
8 months	...	...	8
10 months	...	...	8.5
12 months (1 year)	...	...	9
2 years	..	...	11
3 years	...	...	13
4 years	...	...	15
5 years	...	...	17

It is suggested that figures in Table VI are used as a guide for observing the healthy growth of a baby, and not used as a strict criterion to assess the young one's health. Some babies may gain more while some others less. What is more significant is the consistent low gain in weight or failure to gain at all, indicating thereby that something is wrong.

One of the important causes of unsatisfactory growth, as revealed by the trend in weight-gain, is improper nourishment. In the next chapter we shall consider suitable diets for infants and young children, the provision of which will maintain an uninterrupted and healthy growth of the baby, resulting in joy to the mother and pleasure to those who watch him thrive.

CHAPTER VII

DIET FOR INFANTS FROM BIRTH TO SIX MONTHS

Mother's milk is unquestionably the best food for the baby. The milk contains in correct proportions most of the nutrients necessary for the growth and development of the baby. Indeed, the nutrients are supplied in an easily digestible form. Fortunately, breast-feeding is a tradition among Indian women and the value of mother's milk in infant feeding has been realised in India for over two thousand years as is emphasised in the "*Charaka Samhita*".

Advantages of breast-feeding.—Breast-feeding is safe, simple and clean. In poor communities, with people living in an unhygienic environment, milk from other sources is liable to contamination resulting in bowel infections. It is known that bowel upsets are somewhat less common among breast-fed babies than in artificially-fed young ones.

Feeding at breast is also a happy experience both for baby and mother, giving them an emotional satisfaction. There is a pronounced urge to suck in every infant, and breast-feeding is the best way to satisfy this urge. Moreover, the exercise involved in sucking aids in the proper development of jaws, palate, mouth and cheek muscles. The mother too benefits, since breast-feeding in the first few weeks promotes contraction of the uterus and hastens its return to original size and position.

Breast-feeding.—During the first two or three days after the baby is born, the breast does not secrete milk but yields a yellowish fluid called Colostrum. Colostrum is good for the baby and will take care of his first hunger. Though the amount of colostrum available at each feed is small, the act of sucking during these days promotes the milk flow and soon the breast starts secreting milk. Till then, a drink of boiled cooled water, sweetened with sugar, may be given to the baby at frequent intervals. At first, there may not be sufficient milk for the baby, but the supply increases rapidly provided the mother is keeping good health:

In some parts of India, there is a belief that colostrum of the first milk remains in the breast for 9 months during pregnancy and therefore is harmful. Actually, not only is the colostrum harmless, but it is richer in body-building nutrients than mature milk itself, and it is possible that it may provide valuable materials lacking in milk and needed for the protection of the baby against infectious diseases.

Once breast-feeding has been established, it is advisable to train the baby to regular feeding times. A baby, regularly fed and receiving a sufficient amount of breast-milk, needs little else to keep him healthy for the first four months of life. Thereafter, the baby needs increased amounts of certain nutrients not available in breast-milk but necessary to build strong bones and sound teeth.

It is, therefore, advised that from the fourth month onwards the baby shall be given liquid food supplements rich in these nutrients. Orange or tomato juice, fish-liver oil and egg-yolk are a few such foods which make good the deficiency in breast-milk (See Chapter VIII for further details).

Hints on Breast-feeding

Care of the breast during pregnancy.—Care of the breast is vitally important not only during nursing but also during pregnancy to prevent infections such as sore nipples and breast-abscesses.

A little clear secretion may start oozing from the nipples around the fourth or fifth month of pregnancy and the secretion, if allowed to dry, forms a scab which on removal leaves the skin underneath red and sore.

The condition is prevented by washing the nipples daily with soap and water. The nipples are then dried with a soft towel and massaged with some vaseline. The vaseline may be applied with the thumb and forefinger in such a way as to gently draw out the nipples. This will facilitate to keep the nipples firm and accustom them to being touched. The hands are washed clean with soap and water before undertaking any of the procedures. Special loose clothing is worn which just supports the breast and does not press or bind the organ.

Care of breast in-between nursing.—Absolute cleanliness is essential. The hands shall be washed clean with soap and water before nursing the baby. The nipples are gently cleaned with warm water and wiped dry with a clean cloth before each feed. No solution of any kind shall be used for this purpose as it may cause serious poisoning in infants. The same method of cleaning is adopted immediately after nursing.

Early breast-feeding.—In the early stages, it is wise to nurse the infant on the breast for short periods only, since the amount of colostrum secreted is small and the nipples can get accustomed to the act of sucking by easy stages.

The baby may receive the first feed about 8-12 hours after birth, which incidentally provides rest for the mother after labour. Subsequently the frequency of nursing may be once every 3-4 hours. The new-born sleeps most of the time and wakes up only when he is hungry. It is during these times that he shall be breast-fed. During the first few weeks these intervals are irregular. Thereafter, most babies rapidly adjust themselves to regular feeding times by day and may need no attention during the night. The baby may be fed a small quantity of boiled cooled water just before it is put to bed at night.

Regular breast-feeding.—Once breast-feeding has been established, the baby is nursed for about 10 minutes on either breast at each feeding. It is necessary to make sure that the breast is emptied before changing over to the other. A properly emptied breast ensures a copious flow of milk at the subsequent feeding. Since a ten-minute period is sufficient to obtain whatever milk there is in the breast, longer periods of sucking may lead to swallowing of air. Swallowed air can be got rid of by the mother holding the baby on her shoulder and patting him gently on the back.

Schedule of feeding.—While it is true that there is no rigid time-table as to how often a baby is to be nursed, there is no harm in planning a schedule by trial and error. Frequently, the mother has to run the household besides looking after the baby. In such circumstances, regular feeding times make for the comfort and convenience of both the mother and the baby.

It is advisable to train the baby to a regular feeding schedule from the start. After the first few weeks most babies are quite happy with 5 to 6 feeds during 24 hours, at 3 to 4 hourly intervals. It is recommended that the interval between feeds should not be less than 3 hours or more than 5 hours except during the night when an 8-hour interval is best.

After the night-feed the baby is put to bed separately. Putting the baby in a separate cradle, away from the mother, encourages undisturbed sleep for the baby and provides rest for the mother. It eliminates any risk of the baby being overlaid or suffocated. Sleeping away from the mother also contributes to a smooth and short weaning period.

The baby may cry at times when a feed is not due. In such cases the mother has to assess his real need and not attempt to force-feed. All that the baby may need is to get picked up for a moment or two and patted. He may be thirsty and may be given some boiled, cooled water if it is not the feeding time. In fact, it is advisable to give small feeds of plain boiled and cooled water two or three times during the day, and more often during the hot weather.

Contra-indications to breast-feeding are very few and are as follows: Acute illness in the mother; chronic illness in the mother such as tuberculosis, kidney disease, diabetes etc.; severe and permanently inverted nipples; diseased breast or nipples.

When breast-milk is not available.—If the quantity of breast-milk available daily is not enough or the mother is ill and it is not advisable to breast-feed the baby on medical grounds, the infant will have to be artificially fed.

Cow's milk is most commonly used in artificial feeding. It is rich in body-building principles, compared to human milk, and hence must be suitably diluted with clean boiled water to resemble human milk. Moreover, breast-milk is sweeter than cow's milk and hence some sugar has to be added to cow's milk when it is given to infants.

When cow's milk is to be given, a suitable dilution during the first week would be addition of 2 parts of clean, boiled, cooled water to one part of milk. The proportion of water may be gradually reduced so that by six months, the infant gets whole cow's milk without any dilution. The amount of sugar added per day may be gradually increased from about one teaspoonful in the first week to about 4 teaspoonfuls by six months.

During the first few days of life the baby should be given 3-4 feeds per day. Till the end of the first month, it may be given 6 feeds daily. Subsequently, the number of feeds may be reduced to 5, and this feeding schedule can be maintained till about 6 months.

CHAPTER VIII

DIET FOR INFANTS FROM SIX MONTHS TO ONE YEAR

Infants in our country thrive on breast-milk alone during the first four to six months of life and their growth rate during this period is satisfactory and comparable with that of babies born in America and England. This observation is a proof that breast-feeding is adequate during the early life of the infant.

On the other hand, breast-milk alone is not able to provide sufficient amounts of all the nutrients needed to maintain growth after the first six months. Studies on the lactation performance of Indian nursing women reveal that up till six months after delivery there is generally a steady rise in the output of milk. Subsequently, the milk output diminishes, though, in a few, substantial quantity of milk is secreted even as late as 18 months. If the baby is to maintain the expected rate of growth and remain healthy and well-nourished, supplementary feeding has to be resorted to round about the sixth month of life.

It is not as if supplementary foods are not given to Indian babies, but the type of the supplement administered is unsuitable and inadequate for the rapidly growing child. In several instances it was observed that solid foods were started only around the 18th month of life or later, in the belief that as long as the baby was breast-fed there was no need for any other type of food. It is apt to remark here that the bane of prolonged breast-feeding in our community is not so much the prolongation itself, but the ignorant and exclusive dependence on the dwindling supply of mother's milk for the growth and well-being of the child. The best method of supplementing the baby's food, when the breast-milk supply is failing, is to provide cow's milk. Unfortunately, the cost of fresh milk is prohibitive and only a few babies in our country ever taste milk other than that of their own mothers. The unsuitable nature of the supplement which the baby is induced to take is, therefore, obvious. One finds no difference between the food consumed by the adults of the family and the fare provided for the baby. Plain boiled rice or some other cereal is mixed with the clear supernatant of the "*Pappu charu*" or "*Sambhar*" bereft of vegetables or pulses, and dished out to these babies as a substitute for breast-milk whenever the child cries. It is true that these "cereal gruels" act as a mere substitute since the food appeases hunger and keeps the baby quiet. Unfortunately, the food that satisfies hunger does not always satisfy growth requirements.

It is interesting to note that the above pattern of faulty feeding, particularly during the important weaning and postweaning periods—from about 7 months to about 3 years—is the potent cause for the occurrence of a variety of nutritional deficiency diseases among our infants and children. The nutritional situation is made critical by the recurrence of pregnancy in nearly 50 per cent of the mothers. This consequently leads to stoppage of breast-feeding, resulting in an acute deprivation of even the small quantities of essential nutrients available from that source.

The existing state of affairs described above requires to be remedied immediately, if Indian children have to be saved from disease and death arising out of widespread malnutrition and be given an even chance to grow and develop into healthy adults.

An attempt is made in the following paragraphs to describe the term "weaning" and its significance to the baby. This is followed by a detailed account of the organisation and technique of preparation and feeding of supplementary foods.

What is weaning?—Weaning is an important period in the life of a baby. Indeed, it is one of the most dangerous periods in the life of the Indian child. Weaning is a gradual process. It begins **from the moment supplementary food is started till the child is taken completely off the breast.** Since during this period the baby is switched over from a solely breast-milk diet to other foods, weaning assumes considerable significance from the nutritional point of view. Great care has to be bestowed in selecting and introducing supplementary foods so that in the course of a few months, the frequency of breast-feeding can be gradually reduced and the child completely weaned with access to an adequate, nourishing diet.

How to wean the baby?—As stated already, weaning must be gradual and should commence around the sixth month of life when the first supplements are introduced. Weaning may commence by omitting one nursing and in its place feeding a suitable quantity of the chosen supplementary food. Gradually, the baby is given more frequently small quantities of different supplementary foods and the frequency of breast-feeding is reduced to the minimum. It is desirable to retain the early morning and late-night nursings until the last. At other times, the baby is allowed on the breast for short periods only, to remove sufficient milk so that the mother's discomfort, if any, is relieved. On no account should weaning be postponed beyond the age of eighteen months. It is preferred that the baby is taken off the breast sometime after the 12th month and preferably around the 18th month. He is capable of eating and digesting a variety of foods at this age and there would be no difficulty in introducing the different supplements provided care is observed in selecting the correct type and quality of supplement. Studies have shown that the quantity of breast-milk secreted diminishes as time goes on, and it is imperative that this reduced supply must be made good by increasing the quantity of supplementary food.

Prolonged breast-feeding even up to three years is a feature of infant care among the poor communities in India. A study carried out in South India revealed that 20 per cent of mothers suckled their babies beyond 2 years of age and 13 per cent were still breast-feeding their babies at the age of 2½ years. Nursing a child beyond the second year, though in some instances will provide small quantities of milk, will more than likely create a habit and make the child unnaturally dependent on the mother. It is also undesirable because, by the age of two, the child develops a will of his own and he may object to give up something that gives him pleasure and satisfaction.

Supplementary Feeding

Food supplements from 6 months to 1 year.—It is recommended that feeding is organised in the following three stages on the basis of the physical quality of the supplementary food used :

- (a) Liquid supplements.
- (b) Solid supplements—sieved or mashed well before feeding.
- (c) Solid supplements—Chopped or lumpy.

Liquid Supplements

Milk.—At about the sixth month of life, the frequency of breast-feeding is reduced to 3 or 4 times per day, and animal milk substituted instead. To begin with *fresh cow's milk* or milk from other animals is boiled and cooled and used as the food of choice. Since the proportion of nutrients in animal milk differs from that of human-milk, the former is diluted with boiled and cooled water in the proportion of 2 to 1 for the first feeds. The amount of water is gradually reduced so that in the course of a few weeks the baby receives undiluted animal-milk. Eight ounces (about 225 ml.) of milk per feed for two feeds is an ideal replacement. A small quantity of sugar may be added to sweeten the milk before it is fed. It is of importance to continue feeding 16 ounces of animal-milk right through early and late childhood, if resources permit. In case fresh milk is not available due to various reasons, the baby may be fed reconstituted skim milk (1 : 8), using 2 oz. (55 g.) milk powder per day (The preparation of fluid skim milk is described in Appendix I). Groundnut-milk is another cheap and efficient substitute for fresh milk.

This raises the question as to what is groundnut-milk. Groundnut-milk is the milky fluid obtained by the addition of suitable amounts of water to groundnut paste (Details of the preparation are mentioned in Appendix II). Milk prepared in this way contains nearly similar amounts of body-building and energy yielding nutrients as present in cow's milk. However, unlike cow's milk, the product is grossly deficient in certain protective nutrients. Groundnut-milk resembles cow's milk in appearance and has a similar consistency. Though the milk has a nutty flavour reminiscent of groundnut, it is acceptable to children if sugar is added. Since the preference for the flavour of animal-milk is an acquired one, it is possible to make infants and children learn to like the taste of groundnut-milk.

Cow's milk is expensive and in short supply in our country, and it may not be possible for all to provide 16 oz. (450 ml.) cow's milk as a supplement for the baby between the 6th and 12th month of life and thereafter. In such cases, the quantity of animal-milk may be reduced to 8 oz. (225 ml.) and groundnut-milk fed in its place. Groundnut-milk can replace entirely cow's or buffalo's milk for all food preparations where the latter are used.

Juice of fresh fruits such as oranges, tomatoes, mosumbi, grapes etc., serves to supplement some of the protective nutrients not present in sufficient amounts in breast-milk as well as in animal-milk. While the small amounts of these protective nutrients contained in breast-milk are suffi-

cient in the early months of life, the baby's needs cannot be met from this source later on, particularly for the development of healthy bones and gums. It is recommended, therefore, that the baby be provided with fruit-juice as a supplement from around the sixth month of life. Indeed, it is advantageous to start feeding small quantities of fresh fruit-juice even from the 3rd or 4th month of life.

In the early stages, the fruit-juice is diluted with an equal amount of boiled water and only a couple of teaspoonfuls are fed. The amount of fruit-juice fed is gradually increased and at the same time the dilution with water is cut down, so that in a few weeks time the baby receives about 3 oz. or 85 ml. (a little less than half tumbler) orange juice or about $\frac{3}{4}$ tumbler (6 oz.) fresh tomato juice. Since tomato juice does not contain the same proportion of nutrients as orange juice, double the quantity is required.

In case fresh fruits are not available, green leafy vegetables may be used as an alternative. The leafy vegetable is washed well with water and prepared in the form of soup by boiling it with a minimal amount of water and a little salt and onion. The soup is strained through a wide, meshed cloth and the liquid fed to the baby. The solid material remaining need not be wasted but may be used by the adults of the family.

Fish liver oil.—A small quantity of *fish liver oil* such as cod-liver oil or shark-liver oil as a daily supplement to the diet will provide liberal amounts of some of the important protective nutrients needed for growth and development of the baby. Unfortunately, these protective nutrients are not present in sufficient amounts in the milk of the mother. Fish liver oils are a fairly cheap but rich source of these nutrients and it is recommended that the baby be given, around the sixth month of life or preferably a little earlier, a small quantity of any brand of fish liver oil. It is wise to begin with a few drops and work up to about half a teaspoonful per day given mixed in a small amount of milk. The amount of oil administered may gradually be increased to a teaspoonful per day. It is suggested that fish liver oil administration be continued right through the childhood years.

Solid Supplements Mashed Well before Feeding

Mashed food is started around the 7th or 8th month of life. Around this time, the infant is already receiving animal-milk, fruit juice or vegetable soup and fish liver oil. The first solid food commonly offered is a cereal or a starchy vegetable such as potato, well cooked and mashed prior to feeding. In the case of cereal, small quantities of milk and sugar are added so that the final product has a gruel-like consistency with sweet taste. The mashed tuber is fed as such with a little salt and ghee or butter added for taste.

It is advantageous to start small quantities of these foods. They provide energy for the active, growing baby and contribute smaller amount of body-building and protective nutrients.

Vegetables.—Other excellent and cheap supplementary foods that may be administered in a mashed state are *green leafy and non-leafy vegetables* boiled in a small quantity of water as already described. In the case of non-leafy vegetables, only the soft

pulp is used, discarding the skin and the seeds. The baby may in fact be taught the taste of vegetables if he is first given the extracted soup of vegetables. The secret of success with any supplementary feeding and particularly non-liquid foods is in starting with small quantities to make the baby relish the new food and gradually increasing the quantity so that towards the end of the first year the infant receives nearly 2 to 4 spoons of cereal or starchy vegetable and 1 to 3 spoons of mashed green vegetables.

Other supplements which may be tried with benefit during the age of 6-12 months are *boiled egg-yolk* and later on *boiled egg-white; finely minced or ground, cooked meat or boiled, mashed fish; finely cooked and mashed dals and mashed banana or stewed fruit pulp*.

A small amount of hard-boiled yolk of egg (a fourth of that present in an average size egg) is given to start with, and if the baby likes it, the amount may be gradually increased to a complete yolk of an egg. The yolk of the egg contains valuable protective and blood-forming nutrients. The whole egg may be poached or soft-boiled and fed by the time the baby reaches the age of one year.

A spoonful of very ripe and thoroughly mashed banana is a good choice and seldom causes indigestion. The amount can be gradually increased till the baby is receiving a whole mashed banana or 1-3 spoons of cooked fruit-pulp.

All fruits, with the exception of banana which is mashed, must be stewed and sieved for the one year old baby. Thereafter, it is given simply stewed, with addition of a little sugar and lime-juice for flavour.

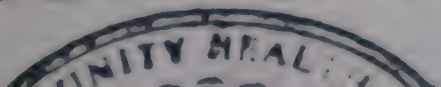
Finely minced and cooked meat or boiled fish and mashed pulses may be fed after suitably flavouring with salt. The pulse and meat preparations may be alternated every day so that the baby receives each of them 3 or 4 times a week. It should be made clear that if all the various supplements listed in the previous paragraphs are given daily, it will result in overfeeding and lead to complications. It is, therefore, necessary that whenever supplements are introduced, the frequency of breast-feeding has to be suitably reduced.

Solid Supplements Unmashed

When the baby starts cutting his teeth, it is time to start changing him over to chopped and lumpy foods. Vegetable may be chopped into small pieces instead of pureed, meat minced fine instead of ground. After a year, leafy vegetable can be given to him just well boiled and soft. Bits of potato, soft-cooked rice and chappati can also be given.

A baby's gums need exercise for the new teeth to grow. A piece of toast or hard biscuit is ideal for him to chew, but care must be taken to see that he does not choke. A slice of raw carrot or fruit segments with all skin and seeds removed are also good exercise for his gums. In fact, as the baby grows, it is better to give fruit segments instead of juice. Fruit provides bulk in the diet and also contains materials that keep the intestines in good order.

In her enthusiasm for feeding solid supplementary foods the mother should not forget the need for plenty of water, especially in the hot weather. Small amounts of



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boiled and cooled water may have to be given 2 or 3 times a day, or more often during hot weather.

Hints on the Introduction of Supplementary Foods

It is true that rigid rules in the choice of supplement and the time of introduction of the supplement may not always work for the child's advantage. The kind of food to be fed, and the age when it should be introduced, ultimately depend on the digestive power of the infant, his likes and dislikes and on what is available during a particular season. Nevertheless, generally after the age of 4 months and particularly after the 6th month, the baby has need for a diet more varied than breast-milk alone. Hence, the mother must have a general idea of the kinds of foods that combine to make a good diet and how they are to be fed.

The following points borne in mind will assist the mother in making a successful and safe transition from a purely liquid diet to one of solid consistency.

Actual feeding of an infant with supplementary foods demands greater skill and ingenuity on the part of the mother than the mere selection of suitable foods and cooking them in suitable ways. The many varieties of food that adults eat are a novelty to the child. Hence, every baby reacts in his own way to each new food. The mother has, therefore, to guide the new baby to learn to eat and enjoy foods that are needed for good growth and sound health. To do this successfully the mother must be patient, resourceful and not too serious. Fortunately, many babies eat readily almost anything that is put into their mouths. A few are suspicious of new tastes and textures, and such infants are not to be rushed.

Offer only one new food at a time and give it for a few days continuously until the baby learns to like it. It is also wise to give only small quantities of the new food until the baby becomes used to the taste. Frequently, a baby may spit out the first spoon of food, but this usually means that he does not know how to swallow the non-liquid food.

A new food may have to be tried for several days before it is discarded as unsuitable. There is, however, an exception to the rule. Food that gives an allergic reaction such as rash, swelling etc., is to be stopped immediately and a doctor consulted. If, however, a particular food is persistently refused or disliked with no apparent reason, it shall not be forced on the baby. There is often a real basis for the dislikes of children. Another food may be substituted for the one refused and the first food introduced again later; or the food is given mixed with another food that the baby knows and likes and then fed. Babies change often in their acceptance of foods and the food refused may be a favourite later on. All new foods are introduced cautiously if the child has frequent bowel upsets.

As soon as a baby learns to take a particular food well, he may be started on the next one, so that in time he learns to accept a good variety of foods. The introduction of a new food becomes easier as time goes on, since it can easily be given along with some food which the baby particularly fancies. It is also better that foods are given separately rather than in mixtures because in this way he can become acquainted with the taste of each individual food.

It is always a good plan to allow a baby some choice in food. A baby's appetite varies a lot from meal to meal and day to day. There is no harm in allowing a baby occasionally to eat larger amounts than usual of a food which his appetite craves. Neither should the mother worry when a baby develops a temporary dislike of any particular variety of fruit, vegetable, cereal or other preparation. During the hot weather the child may not eat as much food as he used to do. Teething, a cold or other minor upset will also take away much of the appetite. Forcing a baby to eat under these circumstances can lead to vomiting. If the appetite does not return to normal soon, it is advisable to consult a doctor.

Unrecognised illness is a cause of failure of appetite and this requires urgent attention by a doctor. Illness is usually accompanied by rapid loss of weight and vitality, and the mother can generally tell when the baby starts getting thin. There are certain other maladies which may make eating painful. Painful and/or tender gums, enlarged tonsils etc., all may result in loss of appetite and indirectly affect the health of the child. Such maladies need prompt medical attention and correction.

CHAPTER IX

DIET FOR CHILDREN BETWEEN 1 AND 5 YEARS

If the mother had gradually introduced in the infant's diet from 6 months onwards the supplementary foods recommended in the previous section, the baby would be receiving all the nutrients essential for growth and development as he approaches one year of age. In the succeeding period of 1 to 2 years, the same diet may be continued in slightly increased quantities, reducing at the same time the frequency of breast-feeding to one or two feeds a day. Supplementary foods for the 1 to 2 year old children are listed below :

Group I :

Milk.—at least 200 ml. a day.

Pulses, meat or boiled fish—once a day.

Egg prepared in any form—one a day or a minimum of 4 eggs a week.

Groups II and III :

Green leafy and other vegetables, cooked—twice a day. *Fruit* stewed, mashed or as juice—once a day—extra fruit may be substituted for vegetable and vice versa.

Group IV :

Cereal or starchy vegetable cooked—two or three times a day and

Fish liver oil —1 teaspoon a day

It is apparent from the above that as for adults, food from all the Food Groups are included to provide a balanced diet for the child. The growth-rate of babies fed on a variety of foodstuffs is superior to that of children subsisting on a single foodstuff. Hence, it is important for the mother to have a general idea of the foods her child needs.

Meal plans for the child of 1-3 and 3-5 years have been worked (Table VII), incorporating the foods listed above in amounts sufficient for each age period. There may be an odd child who may eat more or less. Even so, the amount suggested will provide an idea of the relative importance of the different types of foods in well-planned meals. The time of feeding the different meals shall not be too rigid since the feeding hours depend largely on the family's food habits, which, in turn, are influenced by a variety of factors. At the same time, there shall be, as far as possible, some regularity in the feeding time, without either too long or too short an interval between successive feeds. As the child grows, meal-times can follow those of the rest of the family. All measurements indicated in the "meal plan" (Table VII), except that for fish-liver oil, refer to the three standards listed earlier (p. 14).

TABLE VII
Meal-plans for children

For 1 to 3 year old children :

Time	Food	Amount
On rising	Breast-milk or Boiled animal-milk	1 feed $\frac{1}{2}$ tumbler (110 ml) 4 oz.
9.00—10.00 A.M.	1. Cooked cereal-pulse preparation such as Khicheri, Dalia etc. or Iddli or Bread with butter 2. Soft-boiled or poached egg. 3. Fruit-juice	2 spoons 1—1 $\frac{1}{2}$ iddlies 1—1 $\frac{1}{2}$ slices 1 egg $\frac{1}{4}$ — $\frac{1}{2}$ tumbler
12 noon—1.00 P.M.	1. Cooked cereal or starchy vegetable or Ragi dumpling ball 2. Boiled pulse, fish or minced meat, liver etc. 3. Leafy or green vegetable (cooked)	1 spoon 1 small ball 1— $\frac{1}{2}$ spoon 1 spoon
3.30—4.00 P.M.	1. Fish liver oil	1 teaspoon
6.00—7.00 P.M.	1. Cooked cereal such as suji, broken wheat porridge or ragi porridge	2 spoons
At bedtime	Breast-milk or Boiled animal-milk	1 feed $\frac{1}{2}$ tumbler

Milk and other preparations may be sweetened if liked.

For 3 to 5 year old children :

Time	Food	Amount
8.00—9.00 A.M.	1. Cooked cereal-pulse preparation or Iddli or Bread with butter or Puffed whole ragi (to be eaten with milk) 2. Soft-boiled, poached or scrambled egg or Boiled pluses 3. Boiled animal-milk	2—3 spoons 1—2 Iddlies 1—2 slices Small amount 1 egg 1 spoon $\frac{1}{2}$ tumbler
10.30 A.M.	Fruit-juice or fresh seasonal fruit	$\frac{1}{2}$ tumbler (4 oz.) one

For 3 to 5 year old children :

Time	Food	Amount
12 Noon to 1 P.M.	1. Cooked rice or Wheat or ragi chappati or Boiled potato, sweet potato or tapioca (occasionally)	2—4 spoons 1—2 chappatis Small portion
	2. Curds or milk	$\frac{1}{4}$ tumbler
	3. Cooked leafy or green vegetables or Raw vegetables salad to be given 3 times a week in place of above	1—2 spoons 1 $\frac{1}{2}$ —2 spoons
3.00—4.00 P.M.	1. Fish liver oil	1 teaspoon
7.00—8.00 P.M.	1. Cooked cereal such as suji, broken wheat or ragi porridge	2—3 spoons
	2. Boiled pulse, fish or meat preparation	2 spoons
	3. Boiled animal-milk (may be given at bedtime)	$\frac{1}{4}$ tumbler

Note: A three year old child may not eat much more than a baby of 18 months, since the rate of growth between 2-4 years is comparatively slower than that of the infant or the baby between 1 and 2 years of age. The quantity, which a child eats, depends largely on the size and activity of the child. It is safer to give a child small helpings and extras if he wants more. The quantity may be increased gradually but appetite is the best guide as to the amount of food required at any particular period.

It is advised that the following foods are not given to young children below 5 years of age :

1. Over pungent curries and highly spiced dishes.
2. Fried or roasted foods of any kind.
3. Excess sugar, sweet foods and sweetmeats.
4. Tea, coffee and other stimulants.

CHAPTER X

CHEAP NUTRITIOUS DIETS FOR CHILDREN

In the preceding chapters, details of the many factors involved in the feeding of children and the kind and quantity of food required to ensure optimal growth of the child were discussed. This basic knowledge may enable the mother to realise the true needs of her child, but the cost of the suggested diet may be a bar to its practical applicability.

To overcome this difficulty, nutritious, alternative diets have been evolved which are not only cheap, but can be easily prepared in an Indian home. The ingredients used in their preparation are locally available and already familiar to the mother. The diets are nutritionally adequate and will keep the child who receives them regularly in a satisfactory state of health. The mother may vary the diet by giving the child, in addition, any item from the suggested meal plan described earlier.

A schedule for low-cost meal plans for children is provided in Table VIII. It will be seen that the schedule consists of a few items which are more or less standard and certain others described as "exchange recipes" which could be altered to suit the taste, availability of raw materials, etc.

TABLE VIII

Low-cost meal plan for children

Time	Food-stuff	Amount
On rising	Breast-milk or Boiled animal-milk	One feed $\frac{1}{2}$ tumbler (4 oz. or 110 ml.)
9.00–10.00 A.M.	Fruit-juice (optional) Exchange recipe	$\frac{1}{2}$ tumbler $\frac{1}{2}$ recipe
12 noon to 1.00 P.M.	Ragi preparation, Chappati, dumpling puffed whole ragi or porridge Leafy vegetable (55 gm. raw vegetable) Banana	25 gm. of ragi or more 1 spoon (cooked) 1 small banana
3.30–4.00 P.M.	Fish liver oil (optional)	1 teaspoon (depending on brand)
6.00–7.00 P.M.	Exchange recipe	$\frac{1}{2}$ recipe
At bedtime	Breast-milk or Animal-milk	1 feed $\frac{1}{2}$ tumbler

A list of "Exchange Recipes", which are preparations made out of different combinations of foodstuffs, is provided at the end of the chapter. The recipes are only

slight modifications of what a family ordinarily consumes. The modifications are really in the nature of decreasing the quantity or eliminating the spices and condiments. They act as a nourishing addition to the diet of the babies. The exchange recipes are, as their name denotes, interchangeable and will thus provide variety for the child. Indeed, it is possible to formulate several other examples of recipes using rice, wheat, millets and pulses. The mother can further vary the diet from meal to meal in the same day by giving $\frac{1}{2}$ the quantity of an "Exchange Recipe" for the one meal and another half of a different recipe for the next meal.

The quantities given in each recipe are meant to suffice for two meals for a child of pre-school age. The preparations should be made fresh every day and the quantities may be gradually increased as the child gets older.

The Standard Items in the Low-cost Meal Plan

Milk.—Breast-milk can be given if breast-feeding is continued till the child attains $1\frac{1}{2}$ to 2 years of age and only if the mother is satisfied that the breast is secreting. In cases where breast-milk is not available, half a tumbler of animal-milk is given twice a day. If economic conditions permit, the quantity of animal-milk given may be increased to 16 oz. (450 ml.) per day. It is advised that instead of buying fresh animal-milk, one could buy cheaper skim milk powder and administer reconstituted skim milk or even groundnut-milk.

Fruit-juice.—This is included under the standard items in order to encourage mothers to buy fruit in season and give it to the baby preferably as juice. Ripe bananas are cheap and a mashed banana will provide the baby with energy-yielding nutrients and small amounts of protective nutrients. There are seasons, however, when fruit is scarce and fruit in the diet becomes expensive. At such times, liberal use of green leafy vegetables will act as substitute for fruit.

Fish liver oil.—Fish liver oil as an item of daily diet may sound strange to Indian mothers. Some of them might have heard of fish liver oil being mentioned as a tonic. It is true, fish liver oils are bottled and sold in drug houses, and hence the belief that it is a tonic. So, there is a tendency among some people to buy fish liver oil and administer it to the baby forgetting all about the other requirements and expecting the child to thrive on fish liver oil alone. This is to be strongly deprecated since fish liver oil is not an alternative to nourishing, wholesome food.

A small quantity of fish liver oil daily in the diet of the baby is an excellent way of providing fat and certain protective nutrients which may otherwise be lacking in the diet. If it is not possible to buy fish liver oil, there are other foodstuffs such as green leafy vegetables, egg-yolk, liver and meats etc., which could serve as replacement for fish liver oil.

Cooked ragi roti and leafy vegetable.—Leafy vegetables are rich in protective nutrients and generous quantities are essential for children, particularly if it is not possible to provide fruit-juice or fish liver oil daily. Ragi is a millet rich in certain protective nutrients essential for bones and teeth.

The cost of the meal is approximately 70 paise. The addition of fruit (banana) and fish liver oil will add to the cost by approximately 10 paise per day. To the extent animal-milk is reduced on account of the availability of breast-milk, the cost will be less by 12 paise per every 100 ml. of animal-milk provided less.

EXCHANGE RECIPES

Exchange Recipes No. I and II involve the use of sprouted dried Bengal-gram powder, the preparation of which is as follows :

✓ Sprouted Bengal-gram powder

1. Soak Bengal-gram (channa) in just sufficient water for 12 hours (overnight).
2. Tie the moist grams in a damp cloth and allow to sprout for 1-2 days, depending on the season.
3. Wash sprouted gram and dry in sunlight.
4. When well dried, dehusk, powder the gram and store in an air-tight tin. This powder shall be prepared fresh every week.

EXCHANGE RECIPE I. COST 35 PAISE

✓ Sprouted Bengal-gram porridge (sweet)

Sprouted Bengal-gram powder	... 2½ spoons (55 gm.) 2 oz.
Skim milk powder	... ½ spoon (15 gm.) ½ oz.
[or milk	... ½ tumbler (110 ml.) 4 oz.]
Jaggery	... 1 spoon (30 gm.) 1 oz.
Banana	... 1 small banana
Salt	... a pinch

Method

1. Dissolve gram powder in water. Add mashed banana and pinch of salt. Boil till well cooked.
2. Prepare ½ tumbler reconstituted skim milk, using milk powder. Add to porridge, stirring well.
3. Continue boiling till of a thick pouring consistency.
4. Remove from fire and add powdered jaggery which will dissolve easily in the hot porridge.

Yield = 8 spoons or 2½ bowls.

EXCHANGE RECIPE II. COST 27 PAISE✓ **Sprouted Bengal-gram Khicheri and Curd**

Sprouted, dried Bengal-gram dal	...	1 $\frac{3}{4}$ spoons (40 gm.) 1 $\frac{1}{2}$ oz.
Raw rice	...	2 spoons (55 gm.) 2 oz.
Salt	...	to taste
Water	...	3 tumblers or as needed.

Method

1. Cook gram in water till half done before adding rice.
2. Continue cooking on a slow fire till soft and semi-solid. Add salt.

Yield=12 spoons or 3 bowls.

Curd

Skim milk powder	...	2 teaspoons (15 gm.) $\frac{1}{2}$ oz.
Water	...	$\frac{1}{2}$ tumbler
or Groundnut-milk	...	$\frac{1}{2}$ tumbler (110 ml.) 4 oz.

Method

1. Prepare reconstituted skim milk or groundnut-milk as mentioned in Appendix I and Appendix II.
2. Seed with animal-milk curd.

**EXCHANGE RECIPE III. COST WITH CURD 30 PAISE,
WITH FISH 44 PAISE**✓ **Green gram dal khicheri with curd or boiled fish**

Green gram dal	...	2 spoons (55 gm.) 2 oz.
Raw rice	...	2 spoons (55 gm.) 2 oz.
Salt	...	1 teaspoon
Water	...	2 $\frac{3}{4}$ tumblers.

Method

Prepare khicheri as described in Exchange Recipe II

Yield=8 spoons or 3 $\frac{1}{2}$ bowls.

Khicheri (another method)

Raw rice	...	2 spoons (55 g.) 2 oz.
Green gram dal or other dal	...	2 spoons (55 g.) 2 oz.
Ginger (fresh)	...	2 slices
Garlic	...	4 cloves
Onion	...	$\frac{1}{4}$ medium
Oil	...	2 teaspoons
Salt	...	to taste

Method

1. Clean and wash rice and dal.
2. Grind ginger and garlic.
3. Heat oil, add onion and fry lightly.
4. Add ground ginger and garlic and fry for a minute or two.
5. Add rice and dal, stir a few times and add twice the volume of warm water as there is rice and dal (to note volume, measure rice and dal in a cup).
6. When half-done add salt, reduce heat and cook slowly till soft and all water is absorbed.

Yield=3 bowls.

Curd

As mentioned for Exchange Recipe II.

Boiled fish

Fish	... 2 pieces (55 gm.) 2 oz.
Onion (optional)	... $\frac{1}{2}$ small
Whole green chillie or pepper	... as needed
Ginger (optional)	... 2 slices
Turmeric powder	.... 1 pinch
Oil	... $\frac{1}{2}$ teaspoon
Salt	... to taste

Method

1. Boil, cleaned and washed fish with rest of ingredients, adding onion, if liked.
2. Remove chillie and ginger when boiled.
3. Remove carefully skin and bones of fish and, mash well in gravy.

Yield=2 spoons.

EXCHANGE RECIPE IV. COST 25 PAISE

Rice or wheat chappati with curd and besan curry or omelet ✓

Raw rice	... 2 spoons (55 gm.) 2 oz.
Water	... $\frac{1}{2}$ tumbler (approx.)
Salt (optional)	

Method

1. Wash rice grains once or twice in as little water as possible.
2. Add to roughly 2 to $2\frac{1}{2}$ times the amount of boiling water as there is rice.

3. Cover closely and allow to simmer on a slow fire till soft and all water is absorbed. Stir occasionally.

Yield=3 spoons or $1\frac{1}{2}$ bowl.

Chappati

Wheat flour	... 2 spoons (55 gm.) 2 oz.
Salt (Optional)	
Water or milk (warm or cold)	... as needed.

Method

1. Dissolve salt in a little water and add to sieved flour to make a firm dough, and knead well. (Milk will make the chappati soft and more tasty).
2. Cover with slightly damp cloth and let stand for $\frac{1}{2}$ hour.
3. Uncover, knead just once, divide into small balls and roll in dry flour.
4. Dust a flat board with flour and, with rolling pin, roll out a ball of dough into a chappati $\frac{1}{8}$ " thick.
5. Cook lightly on both sides on a flat heated iron plate (*Tawa* or *kallu*), and puff over burning charcoal. Where coal is not used, press the *phulka* lightly and evenly with a clean cloth while cooking on *tawa* and it will puff out.

Yield=2 chappaties (6" diameter)

Curd

Half the amount stated in Exchange Recipe II.



Basen Omelet or Curry

Omelet

Bengal-gram flour (<i>basen</i>)	... $1\frac{1}{2}$ spoons (40 gm.) $1\frac{1}{2}$ oz.
Tomato (optional)	... 1 (medium size.)
Onion	... $\frac{1}{2}$ small
Green chillie (optional)	... 1

Method

1. Prepare a thin paste with gram-flour and water—add salt.
2. Add chopped onion, tomato and green chillie.
3. Spread a ladleful on a heated iron plate smeared with a little oil, and cook on both sides.

Yield=2 omelets

Curry

Bengal-gram flour	... 1½ spoons (40 gm.) 1½ oz.
Onion	... ½ small
Ginger	... One slice
Garlic	... One clove
Chillie-powder (optional)	... to taste
Turmeric-powder	... a pinch
Oil	... 1½ teaspoon
Salt	... to taste
Cumin seed	... for seasoning (<i>baghar</i>)

Method

1. Sieve Bengal-gram flour and dissolve in water to form a thick paste.
2. Heat oil, add cumin and fry.
3. When cumin is light-brown, add sliced onion, chopped or ground ginger, garlic, chillie powder, turmeric and salt.
4. Cook till soft, stirring off and on.
5. Add gram-flour paste and stir continuously for 3-5 minutes to prevent formation of lumps.
6. Add enough water to make it to a thick pouring consistency and cook, stirring all the time on slow fire till very thick.

Yield=1 to 1½ bowls

EXCHANGE RECIPE V. COST 40 PAISE

**Wheat-basen chappati or rice with dal-ghosh (mutton and dal)
or liver and bone soup**

Rice	... 3 spoons (85 gm.) 3 oz.
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Method

As mentioned in Exchange Recipe IV.

Yield= 4½ spoons or 2½ bowls.

Wheat-Basen chappati

Wheat flour	... 1 spoon (30 gm.) 1 oz.
Bengal-gram flour (<i>Basen</i>)	... 1 spoon (30 gm.) 1 oz.
Groundnut or animal-milk (boiled)	... ¼ tumbler (55 ml.) 2 oz.
Oil	... 1½ teaspoon
Salt (optional)	... to taste

Method

1. Sift flour, prepare chappati dough with milk and salt dissolved in a little water.

2. Knead well, adding 1 teaspoon oil (optional).
3. Prepare chappaties as described in Exchange Recipe IV, and fry with $\frac{1}{2}$ teaspoon oil on heated iron plate.

Yield = 2 chappaties (5" diameter).

Dal-ghosh

Mutton	... 1 oz. (30 gm.)
Red gram dal	... 1 spoon (30 gm.)
Green chillie	... 1
Ginger, fresh	... 2 slices
Onion	... $\frac{1}{4}$ medium size
Turmeric	... 1 pinch
Oil	... 1 teaspoon
Salt	... to taste.

Method

1. Cook meat and dal in $3\frac{1}{4}$ tumblers water with addition of whole green chillie, ginger, turmeric powder and $\frac{1}{2}$ teaspoon oil.
2. When well boiled, add salt. Add more warm water if needed.
3. Fry sliced onion in $\frac{1}{2}$ teaspoon oil and add to dal-ghosh.
4. Remove chillie and ginger prior to serving.

Yield = $1\frac{1}{8}$ bowl.

Liver and bone soup

Liver and/or marrow bones	... 2 oz. (55 gm.)
Potato (optional)	... 1 medium size
Onion	... 1 (small)
Ginger	... 2 slices
Coriander seeds	... 1 teaspoon
Whole black pepper or a pinch of powdered pepper	... 2 corns
Oil	... $\frac{1}{4}$ teaspoon
Salt	... to taste

Method

1. Wash and slice liver and potato. Wash bones, slice onion, keeping aside a quarter of the slices for seasoning, bruise coriander seed.
2. Add liver, bones, potato, onion, ginger, coriander and pepper to 2 to $2\frac{1}{2}$ tumblers of cold water. Bring slowly to the boil and let boil for 20 minutes (longer for bones).

3. Remove liver and bones, mash residue, and strain off liquid which should measure 1 to 1½ tumbler.
4. Fry ½ sliced onion in oil, vanaspati or ghee till brown. Add strained liquid and heat till boiling. Add salt to taste.

Add the cooked liver to the soup after chopping it into small pieces. Also add marrow, if any.

Yield = 1½ tumbler.

EXCHANGE RECIPE VI. COST 40 PAISE

Rice or wheat chappati and tapioca fish stew

Rice

As mentioned in Exchange Recipe IV.

Chappatis

As mentioned in Exchange Recipe IV.

Tapioca Fish Stew

1. Ingredients are the same as for Boiled Fish in Exchange Recipe III, together with 2 oz. (55 gm.) boiled tapioca, or two small (boiled) potatoes.
2. Cook cleaned, washed fish and tapioca with rest of the ingredients in ½ tumbler coconut-milk. (Fish cooks quickly). Season (*baghar*), if liked, with oil and onion.
3. Remove skin and bones of fish as well as green chillies and ginger before serving.

Yield = 3½ spoons.

EXCHANGE RECIPE VII. COST 19 PAISE

Iddlies with cooked *dal*

Rice	... 2 spoons (55 gm.) 2 oz.
Black-gram <i>dal</i>	... 1 spoon (30 gm.) 1 oz.
Salt	... to taste
Water	... ½ tumbler (approx).

Method

1. Soak rice and black-gram *dal* in separate vessels for 2 to 3 hours.
2. When soaked, wash them clean of dust and grit, and grind well.
3. Add sufficient water to make a thick batter.
4. Allow to ferment overnight or for 8 to 12 hours. When fermented, add salt.

5. Pour batter into greased saucers or iddli moulds and steam over boiling water for about 10-15 minutes till done.

Yield = 3 small iddlies.

Cooked dal

Same as dal-ghosh in Exchange Recipe V, without the addition of meat.
Quantity of dal $1\frac{1}{2}$ spoons (45 gm.).

Yield = $1\frac{1}{4}$ bowls.

EXCHANGE RECIPE VIII. COST 48 PAISE

✓ Broken wheat porridge (Sweet)

Broken wheat	... $3\frac{1}{2}$ spoons (85 gm.) 3 oz.
Jaggery	... 2 spoons (60 gm.) (or to taste)
Skim milk powder	... 1 spoon (30 gm.) 1 oz.
(or Milk	... 1 tumbler).

Method

1. Cook broken wheat in water till soft and semi-solid. Broken wheat may be roasted slightly before cooking.
2. Add milk or skim milk (1 tumbler) and boil till thick.
3. Add powdered jaggery and remove from fire.

Yield = $4\frac{1}{2}$ spoons or $2\frac{1}{2}$ bowls.

EXCHANGE RECIPE IX. COST 26 PAISE

✓ Dalia

Broken wheat	... $1\frac{1}{2}$ spoons (40 gm.)
Green gram dal	... $1\frac{1}{2}$ spoons (40 gm.)
Skim milk powder	... $\frac{1}{2}$ spoon (15 gm.)
(or Milk	... $\frac{1}{2}$ tumbler)
Salt	... to taste

Method

1. Roast broken wheat in pan ; when half-done, add green gram dal and continue roasting till light-brown.
2. Add salt and about $\frac{3}{4}$ tumbler of water and cook till soft and semi-solid.

3. Just before removing from fire, add $\frac{1}{2}$ tumbler (110 ml.) milk or reconstituted skim milk and boil for a few minutes (Half a spoon jaggery may be added for those who like it sweet).

Yield = 7 spoons or 3 bowls.

EXCHANGE RECIPE X. COST 42 PAISE

Tapioca or rice payasam (Porridge)

Tapioca with	... 3 oz. (85 gm.)
Bengal-gram <i>dal</i>	... 1 spoon (30 gm.)
or Rice (alone)	... 2 spoons (55 gm.)
Jaggery (to taste)	... 1 to 2 spoons
Milk	... 1 tumbler
Coconut (grated)	... $\frac{1}{2}$ spoon

Method

1. Boil tapioca and *dal* separately in a little water. When soft, mash well. If rice is used, boil in a little water.
2. Mix with 1 tumbler milk. Cook till thick.
3. Add jaggery and coconut and cook a little longer.

Yield = $4\frac{1}{2}$ spoons or $2\frac{1}{4}$ bowls (when rice is used).

Ragi preparations

Ragi (whole grains) should be cleaned free of stones and grit. It is sometimes customary to wash the ragi grains and dry them in the sun before recleaning and powdering. The ragi-flour is always strained through a clean cloth when it is used in preparations for children.

Ragi chappati

Ragi-flour	... $1\frac{1}{2}$ spoons (30 gm.)
Oil	... $1\frac{1}{4}$ teaspoons
Water	... as needed
Salt	... to taste

Method

1. Sieve flour into a utensil. Make a well in the centre of flour. Add salt and a little warm water and mix.
2. Knead till soft, adding more water as required. (If liked, the dough may be kneaded with the addition of 1 teaspoon oil).

3. Make the kneaded dough into a ball and press with hand into a round *roti*.
4. Place *roti* on heated iron plate; when cooked lightly on one side, smear the uncooked side with water (or oil), turn and cook till done on both sides.

Yield = 1 chappati (5" diameter, $\frac{1}{8}$ " thick).

Ragi porridge

Ragi-flour	... 3 spoons (55 gm.) 2 oz.
Sugar or jaggery	... as needed
Salt	... a pinch
Water or decanted rice-water	... 2 tumblers, or more.

Method

1. Heat water till boiling.
2. Make a paste of Ragi-powder in a little cold water.
3. Pour the paste into the boiling water, stirring well.
4. Add salt and allow to cook, stirring well for about 20 minutes.
5. Add sugar or jaggery (if liked) 5 minutes before removing from the fire.
6. Milk can be added to the porridge.

Ragi *ambil* is prepared in the same way. Only sugar is omitted and decanted rice-water is used instead of plain water.

Ragi dumplings or balls

Ragi	... 1½ spoons (30 gm.) 1 oz.
Broken-grains of rice, dehusked <i>jowar</i> or <i>bajra</i> (Ragi to rice in the proportion 2 : 1)	... spoon (15 gm.) ½ oz.
Salt	... to taste
Water	... as needed

Method

1. Boil cleaned and washed grains in a little water till soft. Add salt.
2. Make a paste of ragi-flour in water and add to cooked gruel.
3. Stir well and continue to cook, adding more warm water, if needed.
4. As the mixture thickens, stir constantly till cooked and thick dough is formed.
5. Pour into a plate and, while still warm, roll into balls.

The ragi balls are eaten along with a vegetable, pulse or meat preparation, or with butter milk.

✓ Vegetable Roti

Jowar-flour (wheat or ragi flour can be used)	... 1½ oz. (40 gm.)
Bengal-gram flour	... ½ oz. (15 gm.)
Green leafy vegetable	... 2 oz. (55 gm.)
Onion	... ½ small
Green chillie	... ½ medium size
Salt	... to taste
Oil	... ½ teaspoon

Method

1. Clean and wash vegetable, boil with the addition of salt, chopped green chillie and sliced onion.
2. When well boiled, mash with wooden churner (*Dal-Gotni*) till soft.
3. Sieve Bengal-gram flour, and dry roast on fire till raw smell disappears.
4. Add, along with sieved *jowar*, to mashed vegetable and mix well.
5. Prepare *roti* from dough and place on a heated iron plate (*Tawa* or *Kallu*) with floury side facing upwards.
6. When lightly fried, turn, smear with oil or water, and cook well turning the *roti* again.

Yield = 1 *roti* (6"-7" diameter)

This is eaten with a pulse preparation.

Puffed Ragi

In some parts of the country, ragi is available in the puffed or popped form, similar to puffed rice or maize. Such puffed ragi with milk or soup is a readymade breakfast food for the child.

[NOTE :— For bulk preparation of any recipe mentioned in this publication, the standard value of 1 oz. = 28 gm. may be used in calculations].

*APPENDIX I***PREPARATION OF LIQUID SKIM MILK**

To make **dry skim milk powder** into liquid skim milk, mix the powder with water in any of the following proportions :—

- (A) Powder 1 spoon (1 oz. or 30 gm.) + Water 1 tumbler (slightly less than full) = 1 tumbler milk (8 oz. or 225 ml.)
- (B) Powder 1 bowl (heaped full) (3 oz. or 85 gm.) + Water $2\frac{3}{4}$ tumblers = 3 tumblers milk (24 oz. or 670 ml.)
- (C) Powder 1 (level) tumbler ($4\frac{3}{4}$ oz.) + Water $4\frac{1}{2}$ tumblers = approximately 5 tumblers milk (40 oz. or 1120 ml.)

Method I

1. Measure out required quantity of warm water and keep aside.
2. Measure out skim milk powder into vessel.
3. Add just sufficient water to make a thick paste.
4. Stir or beat well with spoon till blended.
5. Add the remaining water, mix.
6. Heat till boiling, stirring continuously as liquid skim milk foams and burns easily.

Method II

NOTE : A tightly stoppered glass jar or wide mouthed bottle with stopper is needed.

1. Measure out required quantity of warm water.
2. Pour half quantity of water into jar.
3. Measure out skim milk powder and sprinkle on top of water.
4. Cover tightly and shake until skim milk is blended.
5. As foam settles, add rest of water.
6. Heat till boiling, stirring continuously or use as it is.

Keep liquid skim milk in a cool place.

APPENDIX II

PREPARATION OF GROUND-NUT MILK AT HOME

Method

1. Shell fresh pods of ground-nut, and discard shrunken and spoiled kernels. (By-product 1 is the outer shell).
2. Roast kernels mildly for 5 to 10 minutes.
3. Remove the cuticle (pink skin) which comes off easily from the white nut. (By-product 2 is the thin cuticle).
4. Soak the white nut in water for a couple of hours, drain the water and grind the kernels. The house-hold mortar and pestle or a *chakki* may be used after cleaning. The kernels are ground to a fine paste by adding some water if needed.
5. Add lukewarm water 5 to 6 times the weight of nuts originally taken, and stir vigorously for about 5 minutes. Filter through a clean mull cloth and collect the fluid. (By-product 3 is the residue).
6. The fluid milk is boiled well and stirred continuously while boiling to get rid of as much of the nutty flavour as possible. The milk can be kept without spoiling for 8 to 10 hours provided it is stored in a clean vessel closed with a lid.

For children, the thin skin, which forms on cooling the milk, may be removed, thereby reducing the amount of fat in the milk.

Use of by-products :

By-product :

1. Outer shell can be used as fuel.
2. The thin cuticle, covering the kernel, can be used as chicken feed.
3. The residue left over after the extraction of milk can be used in *chutneys*, *vadas* and other common preparations. It may be used to thicken soups or mixed with cereal flours in the preparation of chappaties. Since the residue spoils rapidly, it is important that it be used immediately, or dried thoroughly and stored.

Preparation of ground-nut milk curd—To a cup of cold ground-nut milk, half a teaspoon of honey (optional) and 1 table-spoon of cow's milk curd are added and left overnight to set. A solid curd results with improved flavour and taste. The curd is used within 12 to 24 hours.

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APPENDIX III

CHOICE AND METHOD OF PREPARATION OF VEGETABLES

Vegetables and fruits vary widely in their nutrient content and it is not always possible to interchange one with another without altering the nutritive quality of the diet. It is usually recommended that at least half the amount of vegetables eaten should be composed of the green leafy variety, and on occasions, when leafy vegetable is not available, some fresh fruit such as orange, tomato, gooseberry (*amla*) or lemon (lime juice) may be had instead. Starchy vegetables such as potato, yam and tapioca furnish bulk to the diet but cannot serve as a replacement for green leafy vegetable.

Many of the nutrients present in the vegetables are destroyed by improper handling, storage and cooking. The following practical suggestions on the selection, storage, preparation and cooking of vegetables will aid in the prevention of loss of nutrients.

Selection :

1. It is economical to buy in season vegetables since they are cheap and plentiful.
2. Select vegetables which are fresh. Droopy or wilted vegetables contain less nutrients and rapidly lose even what they contain. It is good to buy just enough vegetable for the day.
3. It is preferable to choose one or two vegetables that may be served raw. Examples are carrots, lettuce, cauliflower and cucumber.

Storage :

1. Remove the damaged or decayed part of vegetable, if any, immediately after buying to prevent its spread.
2. Keep vegetables in a well-ventilated container, away from damp or heat. Long exposure to warm air, such as dumping the vegetables near the fireplace or keeping them in a tightly closed cupboard, affects the freshness of vegetables and the nutritive value as well.
3. Store vegetables such as onions or potatoes in dry open tins.

Preparation or handling :

1. Peel or scrape vegetables very thinly. It saves waste and also a good many nutrients might be lost along with the skin. It is suggested that some vegetables such as potatoes are boiled in their skins to reduce the loss of nutrients.
2. Cut or grate vegetables, especially the peeled ones, after they are washed and drained. Washing or leaving vegetables, especially the cut ones, soaking in water results in loss of nutrients. So does cutting of vegetables into very small pieces.

3. It is best if the vegetable is cleaned and cut just before cooking. Or if it is to be served raw, then cut just before serving.
4. The outer leaves of lettuce and cabbage shall not be discarded, if they are in good condition as they are rich in protective nutrients. Other equally nourishing greens are the leafy-tops of root vegetables such as beet-root, radish, *khol-khol*, turnip and sweet potato vine. These are edible greens and should not be thrown away but utilised in curries or dry preparations whenever these vegetables are bought.

Cooking :

1. Always cook vegetables in boiling water. Add vegetables and reheat the water to boiling point again, quickly, to prevent destruction of nutrients.
 2. Continue boiling steadily on a slow fire. Add salt at the beginning of the cooking period because it tends to reduce the loss of nutrients.
 3. Never use soda to preserve the colour of a vegetable since soda destroys nutrients.
 4. Always use a small amount of boiling water and steam the vegetables in covered pan. A close-fitting lid is important for two reasons. Firstly, the water can be brought to the boiling point more quickly and secondly less water is needed owing to less evaporation. If vegetables are cooked in a large amount of water, some of the nutrients are dissolved out into this water. Excess water shall therefore never be thrown away but served with the vegetable or utilised in other curries.
 5. When cooking a leafy vegetable, the water that clings to the leaves after washing, is sufficient. Add a tablespoonful oil to each pound of leafy vegetable and steam.
 6. Over-cooking destroys nutrients. Cook vegetables, including those added to meat or fish dishes, just enough to soften them and make them palatable. Avoid baking vegetables. Baking increases loss of certain protective nutrients.
 7. Cooking in an iron pan is a good practice.
 8. Cook just enough and just before meals, so that the vegetables can be served as soon as possible after they are cooked. Reheating or keeping vegetables warm on fire leads to further loss of nutrients.
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